

*Rayat Shikhan Sanstha's*  
**D. P. Bhosale College, Koregaon**  
**Department of Physics**  
**Skill based Course -2018-2019**  
**Instrumentation**  
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*Rayat Shikhan Sanstha's*  
**D. P. Bhosale College, Koregaon**  
**Department of Physics**  
**Skill based Course -2018-2019**  
**Instrumentation**

Date:- 01/01/2019

To,  
The Principal,  
D.P. Bhosale college, Koregaon

Subject: - About Skill Based course

Respected Sir,

The department of Physics is going to run Skill Based course on  
“**Instrumentation**” in academic year 2018-2019.

The course will be implemented according to University norms.

Thanking you.

Yours faithfully,



  
Head  
Department of Physics.



Rayat Shikhan Sanstha's

**D. P. Bhosale College, Koregaon**

**Department of Physics**

**Skill based Course -2018-2019**

*Autonomous (Self Financed) Skill based Course certificate course.*

*Instumetation*

**Objectives of the course –**

- The term has its origins in the art and science of scientific instrument-making.
- Instrumentation a collective term for measuring instruments that are used for indicating, measuring and recording physical quantities.
- Instrumentation can refer to devices as simple as direct-reading thermometers, or as complex as multi-sensor components of industrial control systems.
- Today, instruments can be found in laboratories, refineries, factories and vehicles, as well as in everyday household use (e.g., smoke detectors and thermostats)
- Instrumentation system is a home security system. Such a system consists of sensors (motion detection, switches to detect door openings), simple algorithms to detect intrusion, local control (arm/disarm) and remote monitoring of the system so that the police can be summoned. Communication is an inherent part of the design.
- Among the possible uses of the term is a collection of laboratory test equipment controlled by a computer through an IEEE-488 bus (also known as GPIB for General Purpose Instrument Bus or HPIB for Hewlitt Packard Instrument Bus).
- Laboratory equipment is available to measure many electrical and chemical quantities. Such a collection of equipment might be used to automate the testing of drinking water for pollutants.



### **Outcome of the course -**

- Each Student will understand the physics of pressure, temperature, level and flow measurement; mechanical and electrical aspects of instruments used to control dynamics of processes. Dynamics of automatic control including proportional control, automatic reset, derivative action and integral timing.
- Each Student will demonstrate knowledge of basic fundamentals, terms, and units of DC and AC electrical theory. Graduates will have the ability to use test equipment, hand tools and techniques of soldering.
- Each Student will demonstrate the knowledge and ability to develop, construct, and functionally check a process control loop created by the student teams. This is a capstone project for Instrumentation Technology certificate students.

### **Reference Books:-**

1. P. N. Wartikar, J. N. Wartikar - A textbook of Applied Mathematics Vol. I and II
2. Kanti B. Datta - Mathematical Methods of Science and Engineering: Aided with MATLAB
3. B.S. Grewal - Higher Engineering Mathematics
4. Murray R Spiegel - Schaum's outline of Theory and problems of Laplace transforms
5. Murray R Spiegel - Schaum's outline of Theory and problems of Vector analysis and An Introduction to Tensor analysis
6. George B Arfken, Hans Jurgens Weber - Mathematical methods for Physicists
7. Ramakant Gaikwad - Operational Amplifiers, Hall of India, 4th edition, 2009
8. William D. Stanley - Operational Amplifiers with Linear Integrated Circuits, Pearson Education India, 4th edition
9. Albert. P. Malvino, David Bates - Electronic Principles, McGraw-Hill, 8th Edition, 2016
10. J. Millman and C.C. Halkias - Integrated Electronics, Analog and Digital Circuits and Systems, Tata McGraw-Hill Edition 1991



11. Paul Horowitz, Winfield Hill - The Art of Electronics, Cambridge University Press, 3rd Edition
12. G. B. Clayton, et.al. – Operational amplifiers, Newnes publications , 5th Edition, 2003

### **Board of Studies-**

1. Dr. G.M.Lohar (L.B.S. College Satara)
2. Dr. J.B. Thorat (S.G.M. College Karad)
3. Dr. Jamadade. V.S.
4. Shri.Jadhav. S.L.
5. Mr. Kadam. P. K



  
Head  
Department of Physics  
J. P. Bhosale College, Koregaon



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**Department of Physics**  
**Skill based Course -2018-2019**

*Autonomous (Self Financed) Skill based certificate course.*  
*Instrumentation*

1. **Eligibility** : XII std. pass.
2. **Duration of Course** : 3 Month.
3. **No. of Students** : 20
4. **Admission fee** : Rs.- 500 /-(Five hundred )
5. **Examination** : Theory (50 marks),  
: Practical (40 marks)  
For Practical- Journal – 10 marks.  
: Total 100 marks.
6. **Faculty** : Dr. V.S. Jamadade  
: Shri.Jadhav. S.L  
: Mr. Kadam. P. S.
7. **Coordinator** : Shri.Jadhav. S.L
8. **Co-Coordinator** : Mr. Kadam. P. S.
9. **Head of the Department** : Dr. V. S. Jamadade
10. **Director** : Principal, D. P. Bhosale College, Koregaon.



  
**Head**  
Department of Physics  
D. P. Bhosale College, Koregaon



*Rayat Shikhan Sanstha's*  
**D. P. Bhosale College, Koregaon**  
**Department of Physics**  
**Skill based Course -2018-2019**  
**Instrumentation**  
**Admission List**

Sr.No.	Class	Full Name
1	B.Sc-III	Barse Kedar Prakash
2	B.Sc-III	Bhandekar Shubham Sunil
3	B.Sc-III	Dafedar Junaid Ammin
4	B.Sc-III	Jadhav Akshay Chandrakant
5	B.Sc-III	Maner Arbaj Hamid
6	B.Sc-III	Nalawade Akash Ramesh
7	B.Sc-III	Nalawade Mansesh Mahendra
8	B.Sc-III	Nikam Amarjeet Shankar
9	B.Sc-III	Nikam Amruta shivjai
10	B.Sc-III	Phadtare Snehal Dipak
11	B.Sc-III	Shedae Anirudha Ganesh
12	B.Sc-III	Shinde Sasar Sharad



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**Department of Physics**  
**Skill based Course -2018-2019**

**Instrumentation (30Hrs.)**  
**Syllabus (Theory)**

**1. Operational Amplifiers Basics :**

Basics of Operational Amplifiers: Differential Amplifier using transistor, Operational Amplifier - construction, working, characteristics, performance specifications of IC LM 741, LM 324, OP07, LF351/356 etc., Operational Amplifier with negative feedback: Effect of negative feedback on input resistance, output resistance, bandwidth, gain, offset voltage for inverting, non-inverting and differential amplifier.

**2. Integrated Circuits and applications :**

Timer IC 555: internal block diagram, working and its applications in instrument design (Multivibrators, Schmitt Trigger using timer IC).

**3. Mathematical Methods for Instrumentations :**

Matrix algebra, Inverse of a matrix such as Orthogonal, Hermitian, Unitary matrices, First order (linear and nonlinear) differential equations, Curve fitting, Higher order linear differential equations with constant coefficients, Applications to LCR circuits, Fourier series, Fourier transform, Laplace and inverse Laplace transform, Applications.



## Syllabus (Practical)

Sr. No.	Title of Experiments
1	Implementing study of Gates and Logic Operations like, NOT, AND, OR, NR, OR and XNOR using (i) all NAND Gates (ii) all NOR Gates.
2	Implementing a binary to gray, gray to binary or binary to XS3 code converter using gate ICs
3	Simplifying 3, 4 variable logic functions and implementing them using gate ICs AND/OR, OR/AND, ALL NAND and ALL NOR.
4	Implementation of Half and Full Adder Circuit.
5	Study of Multiplexer and Demultiplexer using ICs
6	Constructing flip flops like SR, D, JK and T using all NAND gates and a de-bounce switch.
7	Measurement of operational amplifier parameters
8	Adder and Subtrator using Opamp.
9	Precision rectifiers using Opamp.



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**Instrumentation**  
**Schedule of the course**

Sr. No.	Day & Date	Time	Title of Experiment	Faculty Name
1	Thursday 03/01/2019	10:00 to 12:00 a:m	Operational Amplifiers Basics	Dr. V.S. Jamadade
2	Friday 04/01/2019	10:00 to 12:00 a:m	Implementing study of Gates and Logic Operations like, NOT, AND, OR, NR, OR and XNOR using (i) all NAND Gates (ii) all NOR Gates.	Shri.Jadhav. S.L
3	Thursday 10/01/2019	10:00 to 12:00 a:m	Integrated Circuits and applications	Dr. V.S. Jamadade
4	Friday 11/01/2019	10:00 to 12:00 a:m	Implementing a binary to gray, gray to binary or binary to XS3 code converter using gate ICs	Shri.Jadhav. S.L
5	Thursday 17/01/2019	10:00 to 12:00 a:m	Mathematical Methods for Instrumentations.	Shri.Jadhav. S.L
6	Friday 18/01/2019	10:00 to 12:00 a:m	Simplifying 3, 4 variable logic functions and implementing them using gate ICs AND/OR, OR/AND, ALL NAND and ALL NOR.	Mr.Kadam. P. S.
7	Thursday 24/01/2019	10:00 to 12:00 a:m	Implementation of Half and Full Adder Circuit.	Shri.Jadhav. S.L
8	Friday 25/01/2019	10:00 to 12:00 a:m	Study of Multiplexer and Demultiplexer using ICs	Mr.Kadam. P. S.



9	Thursday 31/01/2019	10:00 to 12:00 a:m	Constructing flip flops like SR, D, JK and T using all NAND gates and a de-bounce switch.	Dr. V.S. Jamadade
10	Friday 01/02/2019	10:00 to 12:00 a:m	Measurement of operational amplifier parameters	Dr. V.S. Jamadade
11	Thursday 07/02/2019	10:00 to 12:00 a:m	Adder and Subtrator using Opamp.	Shri.Jadhav. S.L
12	Friday 01/02/2019	10:00 to 12:00 a:m	Operational Amplifier with negative feedback	Shri.Jadhav. S.L
13	Thursday 07/02/2019	10:00 to 12:00 a:m	Fourier series, Fourier transform, Laplace and inverse Laplace transform, Applications.	Mr.Kadam. P. S.
14	Friday 08/02/2019	10:00 to 12:00 a:m	Precision rectifiers using Opamp.	Mr.Kadam. P. S.
15	Thursday 14/02/2019	10:00 to 12:00 a:m	Offline Examinations	



*[Signature]*  
Head  
Department of Physics  
D. P. Bhosale College, Koregaon



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**Department of Physics**  
**Question Paper - Theory**      **Marks:- 50**  
**Name of Course :- Instrumentation**

**Theory Exam : 2018-2019**

**Time :- 10:00 to 12:00 am**

**Date :-14/02/2019**

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**Question No. 1 - MCQ**

**(20 marks)**

**1). Op-Amp is abbreviated as \_\_\_\_\_.**

- ☐ Operational Amplifier
- ☐ Operand amplitude
- ☐ Operational amplitude
- ☐ None of the above

**2). Op-Amp is a \_\_\_\_\_ type of amplifier.**

- ☐ Current
- ☐ Voltage
- ☐ Power
- ☐ Resistance

**3). Op-Amp is \_\_\_\_\_ coupled voltage type of amplifier.**

- ☐ AC
- ☐ DC



☐ ADC

☐ DAC

**4). Op-Amp has \_\_\_\_\_ gain.**

☐ High

☐ Low

☐ Zero

☐ Medium

**5). A device with direct current coupled, high gain electronic voltage type amplifier with one output and differential input is called \_\_\_\_\_.**

☐ Rectifier

☐ Amplifier

☐ Transformer

☐ Op-amp

**6). An IC contains-----.?**

☐ Passive elements

☐ Active elements

☐ Both Passive and active elements

☐ None of the above

**7). The most complicated component fabricated on IC is -----?**

☐ Diode

☐ Resistor



- ☐ Transistor
- ☐ Conductor.

**8). The bottom layer of an IC serves as?**

- ☐ Connector layer
- ☐ Insulating layer
- ☐ Substrate
- ☐ None of the above

**9). All the active and passive elements are grown on the-----layer of the IC?**

- ☐ First substrate layer
- ☐ The second layer which is a single crystal extension of the substrate
- ☐ The SiO<sub>2</sub> layer
- ☐ The Polysilicon layer

**10). The substrate is typically of size-----?**

- ☐ 25 mils thick
- ☐ 16 mils thick
- ☐ 2 mils thick
- ☐ 6 mils thick.

**11). The second layer of IC is of ----- mils thickness?**

- ☐ 2
- ☐ 3
- ☐ 1
- ☐ 1.5



**12). The diffusion of impurities is done on the-----layer?**

- ☐ Substrate layer
- ☐ Second layer
- ☐ SiO<sub>2</sub> layer
- ☐ All of the above

**13). IC fabrication depends upon---?**

- ☐ Materials
- ☐ Processes
- ☐ Design Principles
- ☐ All of the above

**13). There are \_\_\_\_\_ types of methods of measurements**

- ☐ Two
- ☐ Four
- ☐ Six
- ☐ Seven

**14). \_\_\_\_\_ are the measuring instruments**

- ☐ Ruler
- ☐ Thermometer
- ☐ Stopwatch
- ☐ All of the above



15). In \_\_\_\_\_ measurement methods, the unknown quantity (measurand) is measured directly instead of comparing it with a standard

- ☐ Direct
- ☐ Indirect
- ☐ Both a and b
- ☐ None of the above

16). \_\_\_\_\_ are the examples of direct measurement methods

- ☐ Measurement of current using ammeter
- ☐ Measurement of voltage using voltmeter
- ☐ Measurement of resistance using an ammeter
- ☐ All of the above

17). \_\_\_\_\_ is an example for absolute instruments

- ☐ Tangent galvanometer
- ☐ Rayleighs current balance
- ☐ Both a and b
- ☐ None of the above

18). The measuring instruments are of \_\_\_\_\_ types

- ☐ One
- ☐ Two
- ☐ Six
- ☐ Four



19). \_\_\_\_\_ is an example for systematic errors

- ☐ Zero errors
- ☐ Gross errors
- ☐ Random errors
- ☐ All of the above

20). What is the unit name of length?

- ☐ Meter
- ☐ Kilogram
- ☐ Kelvin
- ☐ None of the above

**Question No. 2 - Write in Brief (Any 3)**

**(30 Marks)**

1. Explain Operational Amplifier with negative feedback: Effect of negative feedback on input resistance .
2. Explain bandwidth, gain, offset voltage for inverting, non-inverting and differential amplifier.
3. Explain in detail Timer IC 555.
4. Explain briefly the Fourier transform .
5. Explain briefly Laplace and inverse Laplace transform, Applications.



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**EXAMINATION MARKLIST -2018-2019**

Sr.No	Name of Student	Result	Grade
1	Barse Kedar Prakash	PASS	B
2	Bhandekar Shubham Sunil	PASS	A
3	Dafedar Junaid Ammin	PASS	A
4	Jadhav Akshay Chandrakant	PASS	A
5	Maner Arbaj Hamid	PASS	A
6	Nalawade Akash Ramesh	PASS	A
7	Nalawade Mansesh Mahendra	PASS	B
8	Nikam Amarjeet Shankar	PASS	A
9	Nikam Amruta shivjai	PASS	A
10	Phadtare Snehal Dipak	PASS	A
11	Shedae Anirudha Ganesh	PASS	A
12	Shinde Sasar Sharad	PASS	B



  
**Head**  
Department of Physics  
D. P. Bhosale College, Koregaon





Rayat Shikshan Sanstha's

# D. P. BHOSALE COLLEGE, KOREGAON



## SKILL BASED COURSE

### Certificate

This is to certify that Mr./Miss..Nikam..Amarjeet..Shankar.....

CLASS : ....B.Sc.-III.....SUBJECT...physics.....

has successfully completed three months "Skill Based Course" in.....

....Instrumentation.....

From ...2018..... to ...2019..... and obtained .....A..... Grade.

  
Chairman



  
Course Co-ordinator

  
Principal





Rayat Shikshan Sanstha's

**D. P. BHOSALE COLLEGE, KOREGAON**



## **SKILL BASED COURSE**

### **Certificate**

This is to certify that Mr./Miss..phadtare...Sneha..Dipak.....

CLASS : ...BSc.-III.....SUBJECT ...physics.....

has successfully completed three months "Skill Based Course" in.....

...Instrumentation.....

From .2018..... to ....2019..... and obtained .....A..... Grade.



Chairman





Course Co-ordinator



Principal



# Skill Based course

ss B.Sc.-III..... Paper No- .....

ne of the teacher- Mr. P. S. Kadlag

Name of the Student

## Physics (Spl)

2851	Barge Kedar Prakash ✓	M
2852	Bhandekar Shubham Sunil	M
2853	Dafedar Junaid Ammin	M
2854	Jadhav Akshay Chandrakant	M
2855	Maner Arbaj Hamid	M
2856	Nalawade Akash Ramesh	M
2857	Nalawade Mangesh Mahendra	M
2858	Nikam Amarjeet Shankar	M
2859	Nikam Amruta shivjai	F
2860	Phadtare Snehal Dipak	F
2861	Shedage Anirudha Ganesh	M
2862	Shinde Sagar Sharad	M
2863		
2864		
2865		
2866		
2867		

# Skill Based course on

"Instrumentation" Rayat Shikshan  
D.P.BHOSALE  
STUDENTS

Month January..... 2019

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
P																
P	P	P	P		P	P		P	P	P					P	P
P	P	P	P		P	P	P	P	P	P					P	P
P	P	P	P		P	P	P	P	P	P					P	P
P	P	P	A		P	P	P	A	P	P	P				P	P
P	P	P	P		A	P	P	A	P	A	P				P	P
P	P	P	P		A		P	A	P	A	P				P	P
P	P	P	A		A	P	P	P	P	P					P	P
P	P	P	P		P	P	P	P	P	P					P	P
P	P	P	P		P	P	P	P	P	P					P	P
P	P	P	P		P	P	P	A	A	A	P				P	P
P	P	P	P		A	P	P	A	P	P	A				P	A

Pradham  
(Kadlag P.S.)



Head  
Department of Physics  
D. P. Bhosale College, Koregaon



②

COLLEGE, KOREGAON *(Instrumentation)*

## TOLL CALL

Working Days ..... ~~Feb~~ 2019

[illegible]

Head  
Department of Physics  
D. P. Bhosale College, Koregaon



③

## Instrumentation

me of the teacher- *Mr. P. S. Kadoy*

Month Feb. 2014 201

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		1							1					P		1
P	A	A	A	A	A	A	A	P	A	A	P	A	P			
P	P		P	P	P	P	P	A	A		P	P	P	P		
P	P		A	P	A	P	P	P	P		P	P	P	P		
P	P		P	A	A	P	P	A	P		P	P	P	P		
P	P		P	P	P	P	P	P	A		P	P	P	A		
P	P		P	P	P	P	P	P	P		P	P	P	P		
P	P		P	P	P	P	P	A	P		P	P	P	P		
P	P		A	P	P	P	P	P	A		P	P	P	P		
P	P		A	P	P	P	A	P	P		P	P	P	P		
P	P		A	P	A	P	P	P	A		P	P	P	P		
P	P		P	P	P	P	P	A			A	P	A	P		
P	P		P	P	A	P	P	P			P	P	P	A		

~~Freedom~~  
(random.p.s)

Department of Physics  
J. P. Bhosale College, Koregaon