



# Online National Training Course on Advanced Instrumentation Techniques and Their Practical Applications for PG and Research Students (AITPA-2021)

Duration : 17 August, 2021 to 7 September, 2021 (Twenty One Days)

## Course Description:-

Now a day candidates with core analytical skills, sound knowledge and practical significance and troubleshooting of different sophisticated analytical instruments are appreciated and required by all the research, manufacturing, processing and contract manufacturing industries as well as government & public testing labs.

This course gives huge scope and ample opportunities in different industries like Food, pharmaceuticals, agrochemicals, fine chemicals, cosmetics, oil and paints perfumery, beverages, rubbers, plastics, clinical research, forensic, public testing labs, etc. . Dr. Shrikant A. Wadhwal, course coordinator and Mr. Amol Gawande, Scientist, Peaks Analytical and Research Centre, Nagpur will provide online training regarding some latest instruments like HPLC, Gas Chromatography, IR, FTIR, UV-VIS, Karl Fischer, GCMS, Atomic Absorptions Spectrophotometer, ICP-OES, UV Diffraction equipments used in laboratories.

## This course is designed for:

- PG and research students intending to work in a laboratory with scientific instrumentation.
- Students preparing for Industrial jobs after completion of PG and Ph.D. degree.
- The course is designed for 40 hrs under value added course.

## COURSE LAYOUT

1. Course will begins with scope, applications and opportunities of Instrumental techniques(HPLC, GC, IR, XRD,UV-Vis, ICP-OES, GCMS, AAS).
2. Instrumentation, theory, calibration, operation, trouble shooting, practical demonstration of HPLC.
3. Instrumentation, theory, calibration, operation, sampling practical demonstration, data collection of Gas Chromatography, GCMS.
4. Instrumentation, theory, calibration, pallate formation, practical demonstration of Infra Red spectrophotometer.
5. Instrumentation, theory, calibration, operation, practical demonstration, data collection of XRD & ICP-OES.
6. Instrumentation, theory, calibration, operation, practical demonstration with examples of UV-Visible & AAS.
7. Explanation of chemical drawings of reactions through Chem Draw, Isis Draw in MS Word .
8. Good laboratory practices, good chromatographic practices

**COURSE TYPE:** Value Added Course

**COURSE LEVEL:** PG and Research Students.

## 1. Course Objectives:-

Now a days candidates with core analytical skills, sound knowledge and practical significance and troubleshooting of different sophisticated analytical instruments are appreciated and required by all the research, manufacturing, processing and contract manufacturing industries as well as government & public testing labs.

The course objectives are:

- To impart the required knowledge of Industrial Scope, Applications & Opportunities for Chemistry
- To impart the required knowledge, necessary skills & to provide the exposure to modern & sophisticated techniques of analysis that are being used all over the world including industries, government & public testing labs
- Theoretical knowledge of HPLC, Gas chromatography and IR, UV-Visible, XRD equipments, GCMS, AAS.
- Practical knowledge on HPLC, Gas Chromatography and IR, XRD and UV-Visible equipments.
- To operate and to maintain the HPLC, GC and IR and XRD equipments.
- Instrumentation, Calibration and their practical applications in Industries.
- Wide courage will be given to Trouble shooting, Operation and method development skills.
- Perform cleaning evaluation on equipment for drug substance and residual detergents.
- Additionally, the course provides introduction to ChemDraw, Isis Draw software for chemical drawings in MS Word.

## 2. Instructional strategies:-

- Online submission of assignments after completion of session. • Interactive session of students and resource person so as to solve difficulties of students.

## 3. Instructional Material:-

- Power point presentations related to the theory of instrumentations.
- Videos of practical demonstration of Gas chromatography, HPLC and IR equipments.
- Soft copies of notes related to the topics covered.
- Chem Draw, Isis Draw software for chemical drawing.

## 4. Summary:-

Upon successful completion of this course, the students will be able to:

- Rectify simple problems with sample preparation or data acquisition.
- Operate the HPLC, GC, XRD, IR, AAS, GCMS, ICP-OES instruments independently.
- Perform the trouble shooting in HPLC.
- Create sample reports including data from the HPLC, GC instrument, XRD, IR equipments.
- Know the applications of these instruments in various Industries which are helpful in job opportunity.
- Set up their own laboratory for business purpose.
- Draft a section of a resume to include this one month training course with specific instruments.
- Draw chemical drawings of reactions through ChemDraw, Isis Draw in MS Word related to their project work of PG and research work of Ph.D. degree.

## 5. Evaluation Strategies:-

- Certificates will be provided to the students with A, B, C grade depending on score secured. (A > 90%, B > 80%, C > 60% )
- 40% marks will depend on assignment submitted and 60% marks will depend on final examination score.

## 6. Duration of the Course:-

- The duration of the course is twenty one days ( 17/08/2021 to 07/09/2021 ).
- The day wise lectures will be uploaded on Google classroom and You Tube also.
- Online demonstration of practical and discussion through Zoom after completion of each session.



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## 7. Detailed time-wise Course session plan:-

### Module : 1

Day	Topic	Assessment
Day - 1	Importance of Instrumentation of HPLC, GC, XRD, IR, UV-VIS Instruments in Industries.	Assignment
Day - 2	Introduction and importance of HPLC Techniques in Chemistry	Assignment
Day - 3	Isocratic HPLC, Gradient HPLC, Chromatographic conditions, Industries work based on Chemistry, Reverse phase HPLC, Normal Phase HPLC	Quiz
Day - 4	Training regarding Column(stationary phase) and liquid (mobile phase)	Assignment
Day - 5	How to inject dissolved sample into the flow path of the mobile phase and detect analytes bands, to quantitative peaks generated	Quiz
Day - 6	Theory & instrumentation of AAS,	Assignment
Day - 7	Data collection with Interactive session	Assignment

### Module : 2

Day	Topic	Assessment
Day - 8	Introduction and Applications of GC Instruments in Chemistry	Assignment
Day - 9	Stationary Phase of Gas Chromatography. Packed Column, Capillary Column of G C instrumentation Demonstration of G C of various samples	Assignment
Day - 10	Gas Chromatography method parameters, Calibration of G C, Column oven, Injector Reproducibility, Detector linearity	Quiz
Day - 11	Practical demonstration of GC Part 1	Assignment
Day - 12	Practical demonstration of GC Part 2	Quiz
Day - 13	Analytical method development	Assignment
Day - 14	Theory & Practical Demonstration of ICP-OES	Assignment

(Online discussion through Zoom after completion of each session)

### Module : 3

Day	Topic	Assessment
Day - 15	Introduction, Applications & Instrumentation & demonstration of IR Spectroscopy	Assignment
Day - 16	Introduction of Applications of UV-Visible Instruments in Chemistry	Assignment
Day - 17	Practical demonstration of UV-Visible spectrophotometer	Quiz
Day - 18	Practical demonstration on Determination of water content by Karl Fischer instrument.& UV Diffraction equipment	Assignment
Day - 19	Introduction, importance & demonstration of XRD in Chemistry	Quiz
Day - 20	Practical demonstration of XRD with data collection Interpretation of IR and XRD spectrum of various sample	Assignment
Day - 21	Final Examination and Valedictory session	

(Online discussion through Zoom after completion of each session)

#### 1. Course Outline:

##### Module -1 Theory, Instrumentation and Practical demonstration of HPLC

- Importance of Instrumentation of HPLC, GC, XRD, IR, UV-VIS Instruments in Industries.
- Introduction and importance of HPLC Techniques in Chemistry
- Isocratic HPLC, Gradient HPLC, Chromatographic conditions, Industries work based on Chemistry
- Reverse phase HPLC, Normal Phase HPLC
- Training regarding Column(stationary phase) and liquid (mobile phase).
- How to inject dissolved sample into the flow path of the mobile phase and detect analytes bands, to quantitative peaks generated.
- Data collection with Interactive session.

##### Module -2 Theory, Instrumentation and Practical demonstration of Gas Chromatography

- Introduction and Applications of GC Instruments in Chemistry.
- Stationary Phase of Gas Chromatography. Packed Column, Capillary Column of G C instrumentation
- Gas Chromatography method parameters, Calibration of G C, Column oven, Injector Reproducibility, Detector linearity
- Demonstration of G C of various samples along with their standard values.
- Practical demonstration of GC Part 1.
- Practical demonstration of GC Part 2.
- Analytical method development.

##### Module -3 Theory, Instrumentation and Practical demonstration of Ir and XRD

- Introduction and Applications of IR Spectroscopy.
- Instrumentation and demonstration of IR instrument.
- Instrumentation and demonstration of FTIR instrument, IR Interpretation with various examples.
- Introduction and importance of XRD in Chemistry.
- Practical demonstration of XRD.
- Practical demonstration of XRD with data collection.
- Interpretation of IR and XRD spectrum of various sample.

(Prof. S. A. Wadhal)  
Course coordinator

(Prof. G. N. Chaudhari)  
Principal