

COURSE MODULE

Program Title	B. Pharmacy
Department	Quality Assurance and Pharmaceutical Analysis
Course Title	Instrumental Method of Analysis

NAME OF INSTITUTION : Y. B. CHAVAN COLLEGE OF PHARMACY, AURANGABAD AFFILIATED UNIVERSITY : DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD DEPARTMENT : QUALITY ASSURANCE AND PHARMACEUTICAL ANALYSIS

4. PROGRAM TITLE : B. PHARM.

4.1. **Program Outcomes (PO):**

PO 01: Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

PO 02: Planning Abilities: Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

PO 03: Problem analysis: Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

- **PO 04: Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
- **PO 05: Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible

citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.

- **PO 06: Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employees, employees).
- **PO 07: Pharmaceutical Ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
- **PO 08: Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
- **PO 09: The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
- **PO 10: Environment and sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 11: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

5. COURSE SPECIFICATION :

5.1. Course Identification and General Information

a.	Course Title:	Instrumental Method o	f Analysis (Theory)
b.	Course Number/Code	BP701T BP705P	
с.	Credit Hours	Theory	Practical
		45(3 Hrs/Week	60 (4Hrs. / Week)
d.	Study level/semester at which this	Semester VII	
	course is offered		
e.	Pre-requisite	Pharmaceutical Analys	is
f.	Co-requisite	-	
g.	Program in which the course is offered	B Pharm	
h.	Language of teaching the course	English	
i.	Prepared by	Mr Khan Sarfaraz & D	r. Barrawaz Aateka
j.	Approved by HOD	Dr. J. N. Shangshetti	

5.2.Course Description:

This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental acknowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

5.3. Course Objectives:

Upon completion of the course the student shall be able to

1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis

2. Understand the chromatographic separation and analysis of drugs.

3. Perform quantitative & qualitative analysis of drugs using various analytical instruments

6.0. Course Outcomes (COs) : (Min. 4 and Max. 6)

(Use Bloom's Taxonomy words)

Code	Course outcome
BP701T.01	Recall and relate the principle of spectroscopy, chromatographyand other commonly
	used instrumental methods of analysis.
CO 110.02	Illustrate skills of operation, calibration and inference of results of instruments such
	as nephalo-turbidimeter, fluorimeter, flame photometer, UV-visible
	spectrophotometer, and FTIR spectrophotometer.
CO 110.03	Plan and select lab experiments using appropriate analytical skills and generate a
	comprehensive analytical report on the findings.
CO 110.04	Construct documentation and interpretation of analytical data
CO 110.05	Solve numericals related to UV- Vis and IR spectroscopy

6.1. Knowledge and Understanding

(Alignment of POs to COs)

Course code	Program Outcome (PO)										
(CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 110.01	3	2	3	3	1	1	1	2	3	3	3
CO 110.02	3	2	3	3	1	1	-	1	3	3	3
CO 110.03	3	3	3	1	3	3	3	2	3	3	3
CO 110.04	3	3	3	1	3	3	3	2	3	3	3
CO 110.05	3	3	3	3	3	3	1	1	3	3	3

Correlation levels 1, 2 or 3 as defined below:

1: Slight (Low);2: Moderate (Medium); 3: Substantial (High); If there is no correlation, put '-'

6.2. Teaching and Assessment Methods for achieving learning outcome:

Teaching Strategies(methods)/Tools used	Methods of Assessment
Lectures (Constructivist learning)	Formative Assessment
Collaborative learning (Discussion)	Case study
Project based Learning	Class test
Blended learning	Multiple choice questions
Inquiry based learning	Assignments
Flash cards	Seminar
Video	Viva Voce
Equipment models	Synopsis
	Tutorials
	Summative Assessment

6.3.Tools for the Teaching and learning

Theory subjects	Practical Subjects
PowerPoints presentation	White boards
• Videos	• Glassware
• Flash Card	Chemicals
• Models	• Instruments
• Software	• Equipment
• Charts	Software
Smart Boards	• Models
White boards	Plants/Crude Drugs
Online Platform	• Animal

6.4. COURSE CONTENT

6.1. Theoretical Aspect:

Order	Topic list/units	Subtopics list	Number	Contact
			of	Hours
			Weeks	
1	Unit I	UV Visible spectroscopy Electronic transitions,	3 and	10
		chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra Beer and	Half	
		Lambert's law, Derivation and deviations.	week	
		Instrumentation - Sources of radiation,		
		wavelength selectors, sample cells, detectors-		
		cell, Silicon Photodiode. Applications -		
		Spectrophotometric titrations, Single component		
		and multi component analysis		
		Fluorimetry Theory, Concepts of singlet, doublet		
		and triplet electronic states, internal and external		
		conversions, factors affecting fluorescence,		
		quenching, instrumentation and applications		
2	Unit II	IR spectroscopy: Introduction, fundamental	3 and	10
		modes of vibrations in poly atomic molecules,	Half	
		sample handling, factors affecting vibrations		
		Instrumentation - Sources of radiation,	week	
		Bolometer Thermocouple Thermister		
		Pyroelectric detector and applications		
		Flame Photometry-Principle, interferences,		
		instrumentation and applications		
		Atomic absorption spectroscopy- Principle,		
		interferences, instrumentation and applications		

		Nepheloturbidometry- Principle,		
		instrumentation and applications		
3	Unit III	Introduction to chromatography	3 and	10
		Adsorption and partition column	Half	
		chromatography-Methodology, advantages,		
		disadvantages and applications.	week	
		Thin layer chromatography- Introduction,		
		Principle, Methodology, Rf values,		
		advantages, disadvantages and applications.		
		Paper chromatography-Introduction,		
		methodology, development techniques,		
		advantages, disadvantages and applications		
		Electrophoresis – Introduction, factors		
		affecting electrophoretic mobility,		
		Techniques		
		of paper, gel, capillary electrophoresis,		
4		applications	2	0
4	Unit IV	Gas chromatography - Introduction, theory,	2 and	8
		Instrumentation, derivatization,	half	
		disadvantages and annliastions	week	
		High performance liquid chromatography	WEEK	
		(HDLC) Introduction theory		
		instrumentation advantages and applications		
5	Unit V	Ion exchange chromatography.	2 and	7
C		Introduction classification ion exchange		/
		resins	half	
		properties, mechanism of ion exchange	week	
		process, factors affecting ion exchange.		
		methodology and applications		
		Gel chromatography- Introduction, theory,		
		instrumentation and applications		
		Affinity chromatography- Introduction,		
		theory, instrumentation and applications		
	TOTAL			45

6.2.Practical Aspects

Order	Name of Experiment	Number of Weeks
1	1 Determination of absorption maxima	4 Hours/Week
	maxima of organic compounds	
2	2 Estimation of dextrose by colorimetry	
3	3 Estimation of sulfanilamide by	
	colorimetry	
4	4 Simultaneous estimation of ibuprofen	
	and paracetamol by UV spectroscopy	
5	5 Assay of paracetamol by UV-	
	Spectrophotometry	
6	6 Estimation of quinine sulfate by	

	fluorimetry
7	7 Study of quenching of fluorescence
8	8 Determination of sodium by flame
	photometry
9	9 Determination of potassium by flame
	photometry
10	10 Determination of chlorides and
	sulphates by nephelo turbidometry
11	11 Separation of amino acids by paper
	chromatography
12	12 Separation of sugars by thin layer
	chromatography
13	13 Separation of plant pigments by
	column chromatography
14	14 Demonstration experiment on HPLC
15	15.Demonstration experiment on Gas
	Chromatography

7.0. ASSESSMENT MECHANISM :

Sr.	Assessment Mechanism	Week due	Marks	Proportion of Final
No.				Assessment
1	Assignments, Exercises & Home works	2 nd week of	10	6%
		every month		
2	Sessional (Internal Theory exam)	As per	15	10%
		scheduled		
		examination		
3	Continuous Practical Assessment	Weekly during	15	10%
	(Sessional Practical exam)	practicals		
4	Final exam (theory)	As per	75	50%
5	Final exam(practical)	University at	35	24%
		end of course		
Total			150	100%

8.0.STUDENT SUPPORT:

Office hours/week	Other procedures
Two hours minimum	

9.0. TEACHER'S AVAILABILITY FOR STUDENT SUPPORT:

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
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Time	12:00-1:00	12:00-1:00	12:00-1:00	12:00-1:00	12:00-1:00	12:00-1:00

10.0. LEARNING RESOURCES:

Sr. No.	Title of Learning Material	Details
1	Text books	 Willard, Merrit, Dean & Settle, Instrumental methods of analysis Van Nostrand. Silverstein, spectrometric identification of organic compounds, Willey. Beckett & Stenlake, Practical Pharmaceutical chemistry, CBS publisher, New Dehli. KempWilliam, Organic spectroscopy, Pal Grav, N. Y. Kalsi P. S., Spectroscopy of organic compounds, New age publishers, New Delhi. Sinder, Text book of HPLC. Chromatographic Analysis of Pharmaceuticals, John A. Adamovics, 2nd Edition. Techniques and Practice of Chromatography – Raymond P. W. Scott, Vol. 70. Identification of Drugs and Pharmaceutical Formulations by Thin Layer Chromatography – P. D. Sethi, Dilip Charegaonkar, 2nd Edition. HPTLC – Quantitative Analysis of Pharmaceutical Formulations – P. D. Sethi.
2	Essential references (as per syllabus)	 Remington: The Science And Practice Of Pharmacy Edited By David B. Troy, Paul Beringer Principles Of Instrumental Analysis 6th Edition, Doughlas Skoog cGMP For Pharmaceuticals By Manohar A Potdar, Pharmamed Press
3	Reference material	WHO and ICH guidelines
4	E-materials and websites	www.ich.org/products/guidelines.html https://en.wikipedia.org/wiki/Quality_managem ent_system http://apps.who.int/medicinedocs/en/d/Js5517e/
5	Other learning material	-

11.0. FACILITIES REQUIRED:

Sr. No.	Particular of Facility Required
1	Lecture Rooms (capacity for 60 students)
2	Laboratory (capacity for 20 students)
3	Computing resources: PC with latest version and hardware/software and utilization of open source and licensed application software
4	Other resources: Appropriate laboratory tools, Chemicals, Glass ware, Apparatus, Instrumentation

12.0. COURSE IMPROVEMENT PROCESSES:

12.1. Strategies for obtaining student feedback on effectiveness of teaching:

Course delivery evaluation by students using: Questionnaire forms and online questionnaires

12.2. Other strategies for evaluation of teaching by the instructor or by the department:

Periodic review by Academic Planning & Monitoring Committee and departmental review committee, Observations and assistance of colleagues, External assessments by advisors/ examiners and auditors.

12.3. Process for improvement of teaching:

Use of ICT tools, teaching aids, Simultaneous practical orientation and theory classes (SPOT), Adoption of reflective teaching.

12.4. Describe the planning procedures for periodically reviewing of course effectiveness and planning for improvement:

Periodic review by departmental meeting, Review of course delivery and outcome through assessment and feedback from all stake holders.

12.5. Course development plans:

Provide inputs for course improvement and update to University Course development Committees (Board of Studies)

13.0. INFORMATION ABOUT FACULTY MEMBER RESPONSIBLE FOR THE

COURSE:

Name	Mr. Sarfaraz A. Khan	
Location	Quality Assurance Lab Cabin	
Contact Detail (e-mail &cell no.)	9923803455, sarfrazkhan3648@gmail.com	
Office Hours	10:00 AM to 5:00 PM	

Name	Dr. Barrawaz Aateka Yahya	
Location	Microbiology lab cabin	
Contact Detail (e-mail & Cell No.)	9923350939, <u>barrawazqa@gmail.com</u>	
Office Hours	10.00 AM to5.00 PM	