# COURSE MODULE

| | |
|---|---|
| **Program Title** | **B. Pharmacy** |
| **Department** | **Pharmaceutical Chemistry** |
| **Course Title** | **Pharmaceutical inorganic chemistry** |

**1. NAME OF INSTITUTION :** Y. B. CHAVAN COLLEGE OF PHARMACY, AURANGABAD

**2. AFFILIATED UNIVERSITY :**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

**3. DEPARTMENT :** PHARMACEUTICAL CHEMISTRY

**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, employers, 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:** | **Pharmaceutical inorganic chemistry** |
| **b. Course Number/ Code** | **Theory -BP104T**<br>**Practical-BP110P** |

| | | | |
|---|---|---|---|
| **c. Credit Hours** | **Theory** | **practical** | **Total** |
| | **45(3hr/wk)** | **60 (4hr/wk)** | **103(07hr/wk)** |
| **d. Study level/ semester at which this course is offered** | **First semester B.Pharm** | | |
| **e. Pre-requisite** | **General Pharmaceutical inorganic chemistry** | | |
| **f. Co-requisite** | **N/A** | | |
| **g. Language of teaching the course** | **English** | | |
| **h. Prepared by** | **Mrs. Afreen Begum Abdul Qayyum (B. Pharm I$^{st}$ SEM A and B. Div)** | | |
| **i. Approved by** | **Dr. K.G. Baheti** | | |

**5.2. Course Description:**

Inorganic chemistry is a science that makes use of the laws of chemistry to study inorganic substances as drugs, i.e. their monographs, study of preparation, standards of purity, limit test for determining quality, purity and storage conditions, , chemical nature, composition, structure, application and influence on an organism, etc

**5.3. Course Objectives:**

- To explain sources of impurities.
- To write Methods to determine the impurities in inorganic drugs and pharmaceuticals.
- To provide knowledge about important inorganic pharmaceuticals in pharmacopoeia regarding their preparation, quality standard and pharmaceutical uses
- To understand the general concepts of inorganic chemistry
- To highlight the domain of radiopharmaceuticals used in the diagnostics and therapy.
- To understand the medicinal and pharmaceutical importance of inorganic compounds.

**6.0 Course Outcomes (CO):(around 5 to 8)**

**(e.g. CO101.1 (CO - course code, 101 subject code as per syllabus, & .1 is first CO)**
**After completion of course, the student should be able to**

| Code | Course outcome |
|---|---|
| **CO 104.01** | Explain impurities present in pharmaceuticals and preparation of organic compounds |
| **CO 104.02** | Write the properties and uses of inorganic pharmaceutical agents |
| **CO 104.03** | Summarize radioisotopes in diagnosis and therapeutics |
| **CO 104.04** | Explain applications of buffers, acids and bases in Pharmacy |

### 6.1. Knowledge and Understanding

**(Alignment of POs to COs)**

| Course code (CO) | Program Outcome (PO) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| **CO 104.01** | **3** | **1** | **1** | **--** | **-** | **1** | **2** | **2** | **1** | **1** | **2** |
| **CO 104.02** | **3** | **1** | **1** | **-** | **-** | **1** | **1** | **2** | **1** | **2** | **2** |
| **CO 104.03** | **3** | **1** | **1** | **3** | **-** | **2** | **1** | **2** | **1** | **3** | **2** |
| **CO 104.04** | **3** | **2** | **1** | **-** | **-** | **1** | **1** | **2** | **2** | **2** | **2** |

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)<br>Collaborative learning (Discussion)<br>Project based Learning<br>Blended learning<br>Inquiry based learning<br>Flash cards<br>Video<br>Equipment<br>Models | Formative Assessment<br>Case study<br>Class test<br>Multiple choice questions<br>Assignments<br>Seminar<br>Viva Voce<br>Synopsis<br>Tutorials<br>Summative Assessment |

### 6.3. Tools for the Teaching and learning

| Theory subjects | Practical Subjects |
|---|---|
| • Power Points presentation<br>• Videos<br>• Flash Card<br>• Models<br>• Software<br>• Charts | • White boards<br>• Glassware<br>• Chemicals<br>• Instruments<br>• Equipment<br>• Software<br>• Models |

| | |
|---|---|
| • Smart Boards<br>• White boards<br>• Online Platform | • Plants/Crude Drugs<br>• Animal |

**6.4. COURSE CONTENTS:**

**Theoretical Aspects**

| Order | TOPIC | No of weeks | Contact hours |
|---|---|---|---|
| 1 | **Impurities in pharmaceutical substances:** History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate<br>**General methods of preparation**, assay for the compounds superscripted with **asterisk (*),** properties and medicinal uses of inorganic compounds belonging to the following classes | 3 | 10 |
| 2 | **Acids, Bases and Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.<br>**Major extra and intracellular electrolytes**: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.<br>**Dental products**: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement. | 4 | 10 |
| 03 | **Gastrointestinal agents**<br><br>**Acidifiers:** Ammonium chloride* and Dil. HCl<br>**Antacid:** Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture<br><br>**Cathartics:** Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite<br>**Antimicrobials**: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations | 03 | 10 |

| | | | |
|---|---|---|---|
| 04 | **Miscellaneous compounds**<br>**Expectorants:** Potassium iodide, Ammonium chloride*.<br>**Emetics**: Copper sulphate*, Sodium potassium tartarate<br>**Haematinics:** Ferrous sulphate*, Ferrous gluconate<br>**Poison and Antidote:** Sodium thiosulphate*, Activated charcoal, Sodium nitrite333<br>**Astringents**: Zinc Sulphate, Potash Alum | 03 | 08 |
| 05 | **Radiopharmaceuticals**: Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide I131, Storage conditions, precautions & pharmaceutical application of radioactive substances. | 02 | 07 |
| | Total | | 45 |

**Practical Aspects**

| **Order** | **Tasks/Experiments** | **Number of Weeks** | **Contact Hours** |
|---|---|---|---|
| **1** | **Limit tests for following ions**<br>1. Limit test for Chlorides and Sulphates<br>2. Modified limit test for Chlorides and Sulphates<br>3. Limit test for Iron<br>4. Limit test for Heavy metals<br>5. Limit test for Lead<br>6. Limit test for Arsenic | **Minimum 1 experiment per week** | **4hr/week** |
| **2** | **Identification test**<br>1. Magnesium hydroxide<br>2. Ferrous sulphate<br>3. Sodium bicarbonate<br>4. Calcium gluconate<br>5. Copper sulphate | **Minimum 1 experiment per week** | **4hr/week** |
| **3** | **Test for purity**<br>1. Swelling power of Bentonite<br>2. Neutralizing capacity of aluminum hydroxide gel<br>3. Determination of potassium iodate and iodine in potassium Iodide | **Minimum 1 experiment per week** | **4hr/week** |
| **4** | **Preparation of inorganic pharmaceuticals**<br>1. Boric acid<br>2. Potash alum<br>3. Ferrous sulphate | **Minimum 1 experiment per week** | **4hr/week** |

**7. ASSESSMENT MECHANISM:**

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

**8. STUDENT SUPPORT:**

| **Office Hours/Week** | **Other Procedures** |
|---|---|
| Two hours minimum | e-mail, etc |

**9. TEACHER'S AVAILABILITY FOR STUDENT SUPPORT:**

| **Days** | **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** | **Saturday** |
|---|---|---|---|---|---|---|
| **Time** | 10.00 to 11.00 am | 04.00 to 5.00 pm | 4.00 to 5.00 pm | 10.00 to 11.00 am | 10.00 to 11.00 am | 10.00 to 11.00 am |

**10. LEARNING RESOURCES:**

| **Sr. No.** | **Title of Learning Material** | **Details** |
|---|---|---|
| 01 | Text books | 1) G.R Chatwal pharmaceutical inorganic chemistry.<br>2) H.P Tipnis,A.S.Dhake inorganic pharmaceutical chemistry. |
| 02 | Essential references (as per syllabus) | 1) Govt.of india, Indian pharmacopoeia, (vol I,II and III) controller of publisher, Govt of india<br>2) A.H.Becckett & Stenlakes practical pharmaceutical chemistry |

| | | |
|---|---|---|
| | | 3) A.I.Vogels text book of quantitative analysis.<br>4) M.L Schroff, inorganic pharmaceutical chemistry<br>5) P.Gundu Rao Inorganic pharmaceutical chemistry. |
| 03 | Reference material | Hand Written Notes. |
| 04 | E-materials and websites | Soft copies (word/Pdf files), PPT's. |
| 05 | Other learning material | Handouts |

**11. 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.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 review committee, 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. INFORMATION ABOUT FACULTY MEMBER RESPONSIBLE FOR THE COURSE:**

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| **Name** | **Mrs. Afreen Begum Abdul Qayyum** |
| **Location** | Chemistry Dept. |
| **Contact Detail (e-mail & Cell No.)** | Mrs. Afreen Begum<br>afreenb68@gmail.com<br><br>8928666929 |
| **Office Hours** | 10:00 AM to 5:00 PM |