University of Pune

Three Year B. Sc. Degree Course in

INDUSTRIAL CHEMISTRY (VOCATIONAL)

S.Y.B.SC. INDUSTRIAL CHEMISTRY

Syllabus

(To be implemented from Academic Year 2014-15)

Submitted by:

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Preamble:

The 3-year B.Sc. Vocational Course in Industrial Chemistry is conducted as a part of the University of Pune approved course in B.Sc. Chemistry. Industrial Chemistry is offered as one of the subjects among the four subjects at the F.Y.B.Sc. level and among the three subjects at S.Y.B.Sc. level. At the T.Y.B.Sc. level, there are two theory courses and one practical course to be offered along with four theory courses and two practical courses of T.Y.B.Sc. Chemistry.

The course "Industrial Chemistry" is being coordinated and conducted by the Department of Chemistry at the concerned centers.

It is therefore to be understood that this syllabus will only operate when it is offered to students who have the basic knowledge of Microbiology, and in certain cases, Biotechnology at the undergraduate level.

It is therefore necessary that the syllabus of B.Sc. Chemistry is simultaneously considered, and that the course in Industrial Chemsitry is an add-on information and practice, along with concomitant studies in Chemistry.

In keeping with the purpose of introducing vocational courses in the affiliated colleges of the University of Pune, and as given in the previous statements of intent by the Board of Studies, the vocational courses are expected to be:

1. Specialized in the sense of being **non-conventional**.
2. They are expected to be **multi-faculty** as well as **multidisciplinary**.
3. The concerned Board of Studies is supposed to keep a **holistic view** and **integrated approach**.
4. The courses are **expected to be different** also because they are incorporated into conventional disciplines.
5. The courses are expected to **establish a linkage with main stream disciplines, market and industry**.

Introduction:

There is a continual demand for chemists in the work force – education, industry and research. Career opportunities for the graduate students are available in manufacturing industry and research institutes at technical level. This course focuses on training students on how chemistry techniques are carried out in industrial practices. Though the fundamentals of chemical practices remains the same in theory and industrial practice, there are several facets of even simple chemical practices that are exclusive to industry. For example, validation of procedures and processes are an integral part of industrial production. This is not taught in practicals at the B.Sc. level. Also, some practices in industry, though simple and sometimes monotonous, need to be standardized. Such standardization procedures are also not extensively taught at the B.Sc. level.

The proposed syllabus lays more stress on practicals as compared to theory. This course will concentrate on experimental practice, and theoretical aspects will be oriented to explain and discuss the experimental practices. This approach justifies the term 'vocational'.

The teaching centre at the college will develop trained manpower for industry, such that employability immediately after B.Sc. is possible.

Trained and competent teachers with experience in industry would be ideal to teach the subject. Besides such teachers, persons from industry could contribute to the course.

Objectives to be achieved:

- To promote the possibility of self employment after B.Sc.
- To bridge up the gap between knowledge based conventional education and market demands and to provide an alternative to those pursuing higher education.
- To enrich students' training and knowledge to practices of Chemistry in industry
- To introduce the concepts of experimental design in Chemistry
- To inculcate sense of job responsibilities, while maintaining social and environment awareness
- To help students build-up a progressive and successful career in industries with a biotechnological perspective

Eligibility

1. First Year B.Sc.:

a. Higher Secondary School Certificate (10+2) or its equivalent Examination with English and Biology; and two of the science subjects such as Physics, Chemistry, Mathematics, Electronics, Geography, Geology, etc. OR

b. Three Years Diploma in Pharmacy Course of Board of Technical Education conducted by Government of Maharashtra or its equivalent. OR

c. Higher Secondary School Certificate (10+2) Examination with English and vocational subject of + 2 level (MCVC) - Medical Lab. Technician (Subject Code = P1/P2/P3). The students should have appeared for Biology as one of their subjects.

2. Second Year B.Sc.:

The students should pass in all subjects at the F.Y.B.Sc. level or at least keep terms (ATKT) of First Year of B. Sc. with Chemistry and Industrial Chemistry as two of the subjects at the F.Y.B.Sc. level. In addition to the above qualification, students who have passed the Diploma course in Pharmacy are eligible however such cases should be approved by equivalence committee of Faculty of Science of the University of Pune.

3. Third Year B. Sc.:

The student should compulsorily clear all First Year B. Sc. Chemistry and Industrial Chemistry courses and satisfactorily keep terms (at least ATKT) of Second Year of B. Sc. with Chemistry and Industrial Chemistry as two of their subjects. Students who may have passed in all subjects at the S.Y.B.Sc. level, but have not cleared all the courses at F.Y.B.Sc. level are not eligible to be admitted to the T.Y.B.Sc. class.

Admissions will be given as per the selection procedure / policies adopted by the respective college keeping in accordance with conditions laid down by the University of Pune.

Reservation and relaxation will be as per the State Government rules.

Standard of Passing

i. In order to pass in the First Year Theory Examination, the candidate has to obtain at least 40 marks out of 100 in each Theory Course. (Minimum 32 marks must be obtained in the University Theory Examination).
ii. In order to pass in the Second Year and Third Year Theory Examinations, the candidate has to obtain at least 20 marks out of 50 in each course of each semester. (Minimum 16 marks must be obtained in the University Theory Examination).
iii. In order to pass in Practical Examination, the candidate has to obtain at least 40 marks out of 100 in each course. (Minimum 32 marks must be obtained in the University Examination).

Award of Class

The class will be awarded to the student on the aggregate marks obtained during the Second and Third year in the Principle subject only. The award of the class shall be as follows:

1	Aggregate 70% and above	First Class with Distinction
2	Aggregate 60% and more but less than 70%	First Class
3	Aggregate 55% and more but less than 60%	Higher Second Class
4	Aggregate 50% and more but less than 55%	Second Class
5	Aggregate 40% and more but less than 50%	Pass Class
6	Below 40%	Fail

ATKT Rules

While progressing from F. Y. B. Sc. to S. Y. B. Sc. Class, the student has to pass in at least 8 courses (out of total 12).

While going from S. Y. B. Sc. to T. Y. B. Sc., at least 12 courses (out of 20) should be cleared. The student will not be able to progress from S.Y.B.Sc. to T.Y.B.Sc. unless all his / her F. Y. B. Sc. courses are cleared.

Equivalence of Previous Syllabus

No equivalence required at S. Y. B. Sc. level, the course titles are same as previous syllabus.

External Students

There shall be no external students.

University Terms

Dates for commencement and conclusion for the First and Second Terms will be declared by the University authorities. Terms can be kept by only duly admitted students. The term shall be granted only on minimum 80 percent attendance at theory and practical course and satisfactory performance during the term.

Medium of Instruction: The medium of instruction for the course shall be English.

Course Structure:

Duration: The duration of B.Sc. (Industrial Chemistry) Degree Program shall be three years.

The syllabus has been structured to progressively inform and discuss the concepts and working areas of the fermentation / biotechnology industry. The training for skill sets required to perform the tasks in the industry has been concomitantly developed through the three-year course.

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S. Y. B. Sc. Chemistry

	Paper	Course Title	Marks	Lectures
Semester I	VOC-IND-INCH – 211	Utilities, unit operations and process instrumentation n	50	Four Hours/Week per Paper (Total 48/Paper per Semester)
	VOC-IND – INCH-212	Inorganic Process Industries	50	
Semester II	VOC-IND-INCH – 221	Unit processes in organic chemical industries	50	
	VOC-IND-INCH – 222	Industrial Pollution	50	
Semester I & II	Practical Course VOC-IND-INCH – 203	Practical Course	100	***Four Hours / Week (Total 96 – Semester I & II)
***Practical to be conducted as two hours each day on two consecutive days / Batch**				

Examination Pattern

Theory paper: University Examination – 40 marks (at the end of each semester)
Internal Examination – 10 marks
Practical course: University Examination – 80 marks (at the end of 2nd semester)
Internal Examination – 20 marks

Theory examination will be of two hours duration for each theory course. There shall be 4 questions each carrying equal marks. The pattern of question papers shall be:

Question 1	10 sub-questions, each of 1 marks; objective type and based on entire syllabus
Question 2 and 3	2 out of 3 sub-questions, each of 5 marks; short answer type questions; answerable in 10 – 15 lines
Question 4	1 out of 2 – long answer type questions; answerable in 20 – 25 lines

Internal examination: Internal assessment of the student by respective teacher will be comprehensive and continuous, based on written test, 10 marks each semester. The written test shall comprise of objective type questions – Multiple Types Questions, True / False, Definitions, Tricky computational problems with minimum calculations. Different sets of question papers may be given in the same class-room. There shall be 20 questions to be answered in 40 minutes, each question of 1mark.

Practical Examination: Practical examination will be of minimum 4 hours duration, carried over on two subsequent days. There shall be 10 marks for laboratory log book and journal, 10 marks for viva-voce and minimum three experiments. Certified journal is compulsory for appearing for practical examination. There shall be two experts and two examiners per batch for the practical examination. One of the examiners will be external.

Setting question papers: Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject.

S.Y. B.Sc. Industrial Chemistry Practicals

VOC-IND-INCH – 203

Practical course –Paper III

Organic Preparations

1) Single stage preparations
   i. p-nitro acetanilide
   ii. p-bromo acetanilide
   iii. aspirin
   iv. quinone
2) Double stage preparations
   i. Sudan I
   ii. p-iodonitrobenzene
   iii. β-naphtoxy acetic acid

Instrumentation

1) Colorimeter
   i. Determination of Cr
   ii. Determination of Mn
2) Potentiometer
   i. To determine the amount of Cl-, I- present in the mixture
   ii. To determine the pKa of monobasic weak acid
3) pH meter
   i. Find the pH of different everyday chemical samples
   ii. To determine the pKa of monobasic weak acid
4) Conductometer
   i. To determine the cell constant of given cell using 0.01 N KCl solution and find the pKa of monobasic acid

Analytical

1) Analysis of given sample of brass
2) To determine the amount of carbonate and hydroxide from the given mixture of mixed alkalies
3) BOD
4) COD

Inorganic preparations

1) Any two coordination compound synthesis using first transition metal series

VOCATIONAL INDUSTRIAL CHEMISTRY (VOC-211) S. Y. B. Sc.

Semester – I Title: Utilities, unit operations and process instrumentation

Total = 48L

Objectives: To know unit operations and process instrumentation related to organic and Inorganic chemical industry.

1.	Utilities in chemical industries	6L
2.	Unit operations in chemical industries	18L
3.	Temperature measurements	4L
4.	Pressure measurements	4L
5.	Electronic pressure sensors	4L
6.	Liquid level measurements	4L
7.	Density measurements	
8.	Fluid flow measurements	4L

Reference books : 1. Unit operation in chemical engineering by W.L. McCabe and J.C. Smith 2. Handbook of chemical engineering by J.H.Perry 3. Unit operations I & II by D.D.Kale 4. K.C.College Handbook 5. Industrial instrumentation by D.R.Eckman

VOCATIONAL INDUSTRIAL CHEMISTRY (VOC-212) S. Y. B. Sc,

Semester –I Title : Inorganic Process Industries

Objectives: To study processes in different inorganic composite industries Topic 1:

1.	Cement	6L
2.	Glass	6L
3.	Metal and alloys	8L
4.	Ceramics	6L
5.	Refractories	7L
6.	Composites	3L
7.	Corrosion	6L
8.	Pigments	6L

Reference books:

1. Industrial chemistry by B.K.Sharma 2. K.C.College Handbook

VOCATIONAL INDUSTRIAL CHEMISTRY (VOC-211) S.Y.BSc.

Semister- II Title: Unit processes in organic chemical industries

Objectives : To study different processes required for organic chemical industry. To study separation and purification of different organic chemical products.

1.	Nitration	8L

2. Halogenation 6L
3. Sulphonation
4. Oxidation 8L
5. Reduction/ Hydrogenaion 8L
6. Amination by reduction 2L
7. Alkylation 6L
8. Esterification 6L

Reference books:

1. K. C. College handbook
2. Unit processes of organic synthesis by P.H. Groginns

VOCATIONAL INDUSTRIAL CHEMISRY (VOC-222) S. Y. B. Sc, Semester –II Title: Industrial Pollution

Objectives: To understand chemistry and pollution and measures for preventing Pollution.

1. Environmental Chemistry 4L
2. Air pollution 6L
3. Analysis of air pollutants and treatment 6L
4. Water pollution 10L
5. Water treatment 10L
6. Sewage and sludge treatment 8L
7. Industrial waste and treatment 4L

Reference books:

1. K. C. College handbook

2. Industrial chemistry by B. K. Sharma

3.Air pollution by M. N. Rao and H. V. N. Rao

Qualification of Teachers:

With minimum postgraduate degree in Microbiology (M. Sc. Microbiology) and qualified as per UGC regulations.

Annexure-II

Structure/ Pattern of Syllabus must be as follows:

1) Title of the Course: Industrial Chemistry (Vocational)
2) Introduction: Pattern Semester
3) Eligibility: Should have offered Industrial Chemistry (Vocational) at F.Y.B.Sc. and Passed F.Y.B. Sc. As per Pune University Rules
4) Examination
    A) Pattern of examination
        i) 40:10 (University semester examination of 40 Marks & Internal assessment of 10
        Marks) Details as per the syllabus
        ii) Pattern of the question paper: As per the specimen given
    B) Standard of Passing : As per Pune University norms
    C) ATKT Rules : As per Pune University norms
    D) Award of Class : As per Pune University norms
    E) External Students : As per Pune University norms
    F) Setting of Question paper/ Pattern of Question paper: As per Pune University norms
    G) Verification of Revaluation : As per Pune University norms

5) Structure of the Course :
    i) Optional
    ii) Medium of instruction : English
6) Equivalence subject/ papers & Transitory Provision: Industrial Chemistry (Vocational)
7) University terms : As per Pune University Norms
8) Subject wise Detail Syllabus : Attached
9) Recommended books : Mentioned in syllabus

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