TYBSc Industrial Chemistry (Vocational)

ANNEXURE – II

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 & S.Y.B.Sc and passed as per 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 syllabus

ii) Pattern of the question paper- As per specimen given

B) Standard of Passing : As per University norms

C) ATKT Rules : As per University norms

D) Award of Class : As per University norms

E) External Students : Not allowed

F) Setting of Question paper/ Pattern of Question paper: As per University norms

G) Verification of Revaluation: As per 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 University norms

8) **Subject wise Detail Syllabus :** Attached

9) **Recommended books :** Mentioned in the syllabus

T.Y.B.Sc- Industrial Chemistry (Vocational)

SEMESTER III Paper V Analytical Methods of Chemical Analysis

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1. Electrophoresis : Separation by Adsorption- Affinity techniques,Affinity elution from Ion exchangers and other Adsorbents, Pseudo affinity adsorbents polycrylamide gel electrophorsis, Isoelectic focussing Isotachophoresis, Two dimensional gel electrophoreisis, Capillary electrophoresis in rotation- stabilized media,Electrophoresis in stabilized salts. Applications in Nuclei acids,Clinical and capillary zone electrophoresis of carbohydrates.

2. Introduction to Hyphenated Techniques : Mass spectrometry principle, Instrumentation, Ionization methods –EL, CI, FAB, arc & spark, photoionization, thermal ionization, Fl*&FD, induced coupled mass spectrometry, laser induced, Photoelectic ionization, SIMS, Mass analyzers – Coupled techniques, GC FTIR, GCMS (Use of stable isotopes) HPLC-MS.
3. X-ray analysis: Diffraction –principle, methods of analysis, single crystal diffraction, powder analysis, X-ray fluorescence and X-ray absorption, applications and numerical problems.

4. Atomic absorption spectroscopy: principle, instrumentation and applications.

5. Flame photometry: principle, instrumentation and applications.

6. Ion selective electrodes: principle, types and applications.

7. Neutron diffraction analysis: principle and applications.

Reference books:
1. Instrumentation methods of analysis by Willard Merrit, Dean and Settle.
2. Introduction to instrumental analysis by Robert Braun,
3. Instrumental methods of chemical analysis by Chatwal and Anand.
4. Analytical Chemistry by Skoog and Holler 9^{th} edition.
5. Physical chemistry by G.M.Barrow.
6. HPLC: Analytical Chemistry by Open Learning John Wiley & Sons, New York, (1991).

7. Protein Purification: Principles & Practice. Spring International, 3rd Edition, New Delhi, StudentsEdn. (1994).

Semester IV Paper V Entrepreneurship Development

Entrepreneurship is a tremendous force that can have a big impact in growth, recovery, and societal progress by fuelling innovation, employment generation and social empowerment.

Through entrepreneurship education, young people, including those with disabilities, learn organizational skills, including time management, leadership development and interpersonal skills, all of which are highly transferable skills sought by employers.

The syllabus for T.Y.B.Sc., Vocational students thus is aimed at creating an awareness amongst the students about the benefits of becoming an entrepreneur and at the same time equip them with information about a good and a viable opportunity; making a business plan by assessing the techno-economic feasibility, seeking financial assistance, variety of procedures and formalities for setting up an Small Scale enterprise, taking decisions in such a manner so that entrepreneurship becomes a life time career goal.

OBJECTIVES:

- To create awareness about self-employment and motivate the students to go for self-employment.
- To study entrepreneurship concepts and their applicability.
- To familiarize the students to the practical world of enterprise/business.

1. INTRODUCTION:

Concept of entrepreneurship, Historical background, need and scope of entrepreneurship in modern society, Entrepreneurial behavior, attributes and skills.
Key elements of entrepreneur, Entrepreneurial process, Entrepreneurial culture,
Environment of Entrepreneurship, Socio economic origins of Entrepreneurship,
Barriers of Entrepreneurship and means to reduce those, types of Entrepreneurs, Characteristics of Entrepreneur. 8 Lectures

2. BUSINESS ORGANIZATIONS:

Forms of business organizations such as sole proprietorship, partnership, Joint Stock Company, cooperative organization etc.
Meaning and definition , Relative merits and demerits of each form, ,
Types of Small Scale Industry.
3 Lectures

3. Study of organizations promoting Entrepreneurship

Sources of Information: Where to go for what?

a) District Industry Centre (DIC)
b) Maharashtra Industrial Development Corporation (MIDC)
c) Maharashtra State Small Industries Development Corporation (MSSI DC)
d) Small Industries Services Institute (SISI)
e) National Institutes of Entrepreneurship and Small business Development (NIESBUD)
f) National Entrepreneurship Development Board (12) (NEDB)
g) Entrepreneurship Development Institute of India
h) Commercial and Co-operative Banks
i) State Industrial Development Bank (SIDBI)
j) Pollution Control Board 3 Lectures

Legal Aspects of Small Business:

Elementary knowledge of Income Tax, Sales Tax, VAT, Service Tax, Patent Rules, Excise Rules, Factory Act and Payment of Wages Act**,** TDS act Procedures for registration of SSI, TDS no, PAN no.
2 Lectures

3. ENTREPRENEURSHIP DEVELOPMENT:

Identification of opportunities for entrepreneurship, ideas to start new business, criteria for selection of new product or service, Market Survey as a tool, Technical and economic feasibility of a project, Role of consultancy organizations. 8 Lectures

Project formulation and project report preparation (Use guidelines given in Schedule II)
4 Lectures

4. FINANCIAL ASPECTS:

Govt/Public sources of finance

Sources of finance, Role of various funding agencies, government and commercial Role of various funding corporations and funding institutes such as chamber of commerce, MSFC, MCED, NSSIDC, Banks, special institutes such as IDBI,MIDC,SICOM etc, Working capital, cash flow, fund flow, study of basic financial statements, costing and pricing, breakeven point, SWOT analysis.

Private Sources

1. Equity –Angel finance , Venture capital
2. Debt Finance – Loans from banks loan against co-lateral security, PMYR-Loans with subsidy from Central GOVT, State Govt , CGTSME(Central Grant For Small Medium Enterprise)

8 Lectures

5. MARKETING ASPECTS:

Meaning, scope and importance, Marketing strategy, Market segmentation, marketing channels. Marketing mix and its effect.
Digital marketing through Web browsing, Face book , Google search engines SMS campaigns , Mailers , Hand bills etc 6 Lectures

6. HUMAN RESOURCE ASPECTS: (H.R Policies)

Concept and scope in modern industry,
Different modes of employment, Placement of proper person for a job, Interpersonal relations and communication skills, training of personnel, guidance for stress management, soft skills.
Drafting -Appointment letter, termination tenure , experience certificates , exit policies
Legal liabilities of employees, Group insurance for factory workers, understanding WAC (Workers Accident Compensation)

6 Lectures

Practicals/ Assignments

The practicals to be conducted are with an objective to transform the knowledge gained by the students in their classes to real life experience. These practicals will be based on the vocational subject and the Principal subject a student has offered

Internal assessment should carried out on the practicals/ assignments done by a student

Sr. No.	Title of Practical	Objective	Mode
1.	Role of District industry centre	Understand the working of District industry centre	Visit and report submission
2.	Visit to a small scale Industry	To understand plant location and plant layout and to submit a report on the guidelines given in **schedule I**	Visit and report submission

3.	Visit to a service unit	To study the legal aspects of a service unit and to submit a report	Visit and report submission
4.	Entrepreneurial ideas	Describe in brief two entrepreneurial ideas of yours	Home assignment
5.	Project formulation	Prepare a preliminary document about an enterprise you want to start It should contain executive summary, customer/target market analysis and strategy (use guidelines given in **schedule II**)	Home assignment
6.	Review business plans For this Plans should be exchanged with other teams	Submit a **review** of a business plan of **other team**. It should include critical and constructive comments	Home assignment
7.	Drafting a business plan	It should contain executive summary, customer/target market analysis and strategy, marketing and operations, risks, management team and financial projections	Power Point Presentation

RECOMMENDED BOOKS

Text book

1. Dynamics of Entrepreneurial Development and Management – Shri. Vasant Desai.(Latest edition)

Reference books (Latest Editions)

1. Environment & Entrepreneur: Mr.B.C.Tondon
2. Business Environment: Dr.G.V.Kayande Patil
3. Udyogvardhini –MCED
4. Basic Communication Skills: By P. Kiranmai Dutt & Geetha Rajeevan, 2000
5. Fundamentals of Office Management: By J.P. Mahajan , Office Management – By S. P. Arrora, latest edition
6. A guide to small Scale Entrepreneurs, Director of Industries, Govt. of Tamil Nadu Chennai, latest edition
7. Entrepreneurship and small Business Management- Dr. C. B. Gupta & Dr. Khanna
8. Project Management- K. Nagarajan
9. 100 project Reports Yashwantrao Chavan Open Universiy (YCMOU) Edition
10. Entrepreneurship Ideas in Action Cynthia L. Greene (YCMOU) Edition

Schedule-I

Visit to a small scale Industry

1	Year of commencement of the project	
2	Work experience of the entrepreneur before staring the project	
3	Detailed information of the product	
4	Type of customers using their product	
5	Pricing details of all the product range	
6	No. of workers/ Staff working in the Unit	
7	Turnover in the last three years	
8	Mode of Advt/Marketing adapted for promoting the Products	
9	Investment done at the time of starting the project	

Schedule II

Project formulation

1	Product /services Selected its justification	
2	Capital investment required to start the Services /Product	
3	Minimum Infrastructure requirement	
4	Rent as per current rates for the same premises/ Office /Factory	
5	Various Competitors currently for the same product /Services	
6	Your unique selling proposition USP ie write down why your product will be preferred by the customer as against the present competition. 1) Features 2) Cost 3) Geographic location 4) service 5)durability	
7	Marketing Strategy used for Advertising your product	
8	Various digital marketing methods to be selected	
9	What will be your ROI(Return On Investment)	
10	What will be your Break even point	
11	How will you be raising the finance for the same	
12	Prepare a three years Balance sheet, / P/L statement taking help from a Third year commerce stream student.(optional)	

T.Y.B.Sc- Industrial Chemistry (Vocational)
SEMESTER III Paper VI Basic Chemical Industries -I

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1. MANUFACTURE OF AMMONIA, NITRIC ACID, SULPHURIC ACID & FERTILISERS

A. MANUFACTURE OF AMMONIA, NITRIC ACID, SULPHURIC ACID

- Physico chemical principles regarding the manufacture of ammonia, nitric acid and sulphuric acid.
- Manufacture of ammonia by modified Bosch and Haber process with flow sheet use of ammonia.
- Manufacture of nitric acid by Ostwald's process, concentration of nitric acid and use of nitric acid.
- Manufacture of sulphuric acid by contact process, uses of sulphuric acid.

B. FERTILISERS

- Plants nutrients, need for fertilizers, qualities of fertilizers, NPK ratio, classification of fertilizers, straight and mixed fertilizers.
- Nitrogenous fertilizers, manufacture of ammonium nitrate, urea, ammonium sulphate, phosphate fertilizers manufacture of triple phosphate and super phosphate, potassium fertilizers.

Ref 1:-pages- 518-523, 530-538, 564-570
Ref 2:- pages- 303-310, 310-318, 327-340

2. SUGAR AND FERMENTATION INDUSTRIES

A. SUGAR

- Importance of sugar industry, manufacture of raw and refined sugar with flow sheet, estimation of sugar (physical and chemical methods)

B. FERMENTATION

- Definition of fermentation, importance of various fermentation industries, basic requirements for fermentation, steps in fermentation process.
- Manufacture of alcohol from molasses, distillation, coffey still, preparation of absolute alcohol, various useful fractions and their uses, proof sprit, denatured spirit.

Ref1:- pages- 893-898
Ref 2:- pages – 681-685, 689-690.

3. EXPLOSIVES AND TOXIC CHEMICAL WEAPONS

A. EXPLOSIVE

- Introduction, classification, characteristic of explosives.
- Study of cellulose nitrate, trinitro benzene, trinitro toluene, dynamite, gunpowder, RDX, HMX, tetryl, pentyl, hexyle, lead azide, with respect to their structure, properties and uses

B. TOXIC CHEMICAL WEAPONS

- Introduction, importance requirement of toxic chemicals
- Study of the following:- mustard gas, phosgene, nerve gas adamsite, chloro acetophenone, chloropicrin, screening smokes.

Ref 1:- pages- 919-933

4. PESTICIDES

- Introduction, classification,
- Study of the following types: - Organo chlorine pesticides like DDT, BHC & Aldrin.
- Organo phosphorous pesticides, malathion & parathion.

Rodenticides, fungicides, herbicides, fumigants and repellants (one example each).
Ref 1:- pages – 952-970
Ref 2:- pages – 462-463, 468-471.
5. PAINTS
Introduction, classification of paints, constituents of paints in brief.
Manufacture of paints, qualities of good paint, emulsion paints, paint removers, varnishes enamels, lacquers, thinners in brief.
Ref 1:- pages 738-752.

SEMESTER IV Paper VI Basic Chemical Industries -II

48L

1. SYNTHETIC POLYMERS
Introduction, classification based on – types of reaction used, structure, origin, effect of heat and use of pattern.
Molecular weight Mn and Mw (only definition) significance of molecular weight with respect to polymer properties.
Study of important plastics, fibres, rubbers and adhesives with respects to
a) Structure, b) reaction used to prepare, c) properties d) uses.
Ref 3:- pages relevant pages
A. PLASTICS
Introduction, classification, properties of plastics, effects of structure on properties
Configuration of plastics – atactic, syndiotactic & isotactic
Study of following plastics with respect to their structure, properties and uses
Phenol formaldehyde resins, resols, novolaks.
Polyester resins.
Poly ethylene, poly propylene, poly styrene, cellulose acetate.
Malamine formaldehyde resins.
Poly vinyl acetate, poly vinyl chlorides and polyvinyl alcohols
Epoxy resins
Silicone resins
Ref 1:- pages- m796-845
Ref 3:- relevant pages
B. ELASTOMERS
Rubbers: origin, importance, types of rubber, natural rubber, gutta percha guayle rubber, balata.
Refining of crude rubber, drawbacks of natural rubber, vulcanization, technique of vulcanization.
Synthetic rubber, poly butadiene, buna –S or SBR rubber, neoprene, nitrile rubber, butyl rubber, silicone rubber, & poly urethane.
Ref 1:- pages – 848-871
Ref 3:- relevant pages
C. SYNTHETIC FIBRES
Introduction, natural and artificial fibres characteristics and limitations.
Study of following synthetic fibres :-
Rayon (nitro cellulose) cupra ammonium rayon, acetate rayon, nylon 66, nylon-6, terylene (Dacron) Teflon & saron.
Ref 1:- pages770-788.
Ref 3:- relevant pages

D. ADHESIVES

Introduction process of bonding, classification, preparation, properties and uses of protein, adhesives, animal glue and starch adhesives.

Synthetic resins adhesives, rubber based adhesives, celluloic and silicate adhesives.

Ref 1:- pages- 672-680.

2. DRUGS AND PHARMACEUTICAL INDUSTRIES

Definition of drug, qualities of drugs, classification of drugs (functional and chemotherapeutic drugs).

Meaning of following terms with one example: - analgesic, antipyretic, diuretics, sulpha drugs, anaesthetics, antibiotics, antacid, anti inflammatory, tranquilisers.

Synthesis and use of following drugs :- paracetamol, sulphanilamide, benzocaine, synthetic penicillin

Manufacture of aspirin with flow sheet.

Ref 2:- pages -803-804, 818-822.

Ref 5:-page relevant pages

3. DYES

Definition of dye, Ottowitt's theory of colours, nomenclature and classification as per their chemical constitution and mode of dyeing

Synthesis and use of following dyes: - methyl orange, rosaniline, crystal violet, phenolphthalein, fluorescei and alizarin.

Manufacture of indigo with flow sheet.

Ref 1:- pages- 784-792.

Ref 4&5 relevant pages

4. SOAPS AND DETERGRNTS

Definition of terms like soaps, surfactants, detergents, classification of surfactants.

Manufacture of soap by continuous process with flow sheet.

Special soaps

Raw materials for detergents with flow sheet.

Cleaning action of soaps and detergents, household detergents.

Ref 1:- pages – 713-716, and relevant pages

Ref 2:- pages -529-549

5. PERFUMES AND FLAVOURS

Introduction, definition of term: - perfumes, vehicles, fixatives, types of fixatives.

Isolation of essential vegetable oils (various methods).

Classification of odorous compounds: - alcohols, esters, carbonyl compounds, diphenyl compounds. Examples—citronellol, muscone, nitro muscone, vanillin, piperonal and cinnamaldehyde

Natural perfumes from flowers, fruit flavours

Ref 1:-pages -934-951

Ref 2: pages -484-487 and relevant pages

REFERENCE BOOKS

1. Industrial chemistry by B. K. Sharma 10th edition (Goel Publishing House Meerut, India).

2. Shreeve's Chemical Process Industries fifth edition by G. T. Austin (Mc Graw Hill)

3. Polymer Science by V. R. Gowarikar 1986.

4. Organic Chemistry by I. L. Finar Vol I.

5. Organic Chemistry by I. L. Finar Vol II.