UNIVERSITY OF MUMBAI

No. UG/73of 2018-19

CIRCULAR:-

Attention of the Principals of the affiliated Colleges and Directors of the recognized Institutions in Science & Technology Faculty is invited to this office Circular Nos. UG/156 of 2016-17, dated 16th November, 2016 relating to syllabus of the Bachelor of Science (B.Sc.) degree course.

They are hereby informed that the recommendations made by the Board of Studies in Chemistry at its meeting held on 28th May, 2018 have been accepted by the Academic Council at its meeting held on 14th June, 2018 **vide** item No. 4.41 and that in accordance therewith, the revised syllabus as per the (CBCS) for the Chemistry of T.Y.B.Sc. Physical Chemistry, Inorganic Chemistry, Organic Chemistry and Analytical Chemistry (Sem - V & VI) (3 and 6 Units) including Applied Component Drugs and Dyes, Heavy Fine Chemicals and Petrochemicals has been brought into force with effect from the academic year 2018-19, accordingly. (The same is available on the University's website www.mu.ac.in).

(Dr. Dinesh Kamble)
I/c REGISTRAR

MUMBAI – 400 032
6th ~~June~~ July, 2018

To

The Principals of the affiliated Colleges & Directors of the recognized Institutions in Science & Technology Faculty. (Circular No. UG/334 of 2017-18 dated 9th January, 2018.)

A.C./4.41/14/06/2018

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No. UG/ 73 -A of 2018 MUMBAI-400 032 6th ~~June~~ July, 2018

Copy forwarded with Compliments for information to:-

1) The I/c Dean, Faculty of Science & Technology,
2) The Chairman, Board of Studies in Chemistry,
3) The Director, Board of Examinations and Evaluation,
4) The Director, Board of Students Development,
5) The Co-Ordinator, University Computerization Centre,

(Dr. Dinesh Kamble)
I/c REGISTRAR

T.Y.B.Sc. Applied Component
HEAVY & FINE CHEMICALS Syllabus

SEMESTER V

HEAVY & FINE CHEMICALS

COURSE CODE: USACHFC501 CREDITS: 02 LECTURES: 60

Unit I-

1.1 Introduction to Chemical Industry. Explanation of the terms Heavy (Bulk) and Fine (Speciality) Chemicals . **3L**

1.2 **Silicates:**

a) Introduction to silicates:Properties,structure and types of silicates. Preparation of sodium silicate**.** **4L**

1.3 Manufacture and applications of the following: -

a) Talcum powder b) Nitric acid **4L**
c)Sodium dichromate d)Chromium trioxide **4L**

Unit –II

2.1: Pumps for chemical work

Introduction of pumps

a)Pumping equipments for liquids — piston pump, diaphragm pump, gear pump.

Centrifugal pumps and submersible pumps. **7L**

b) Vacuum systems oil sealed pumps, ejectors. **4L**

2.2 Fertilizers:Preparation, properties and uses of **4L**

a) Normal superphosphate b)Triple Superphosphate

c) Ammonium nitrate d) Ammonium Sulphate

Unit –III

3.1 Brief idea about the economic aspects of chemical manufacturing processes with respect to Location, Raw materials, Energy, Capital, Manpower, Ecological aspects, Tax benefits. Writing a Project Report for setting up an Industry **6L**

3.2 Brief account of perfumes, flavours and sweeteners:

a)Perfumes: Introduction, classification (ethers, esters and essential oils) Composition, formation, blending and applications. Synthesis of α and β -ionone's from citral . **3L**

b)Flavours: Introduction,Classification (natural and synthetic),applications of Vanillin, Coumarin(structures),Synthesis of Vanillin. **3L**

c)Sweeteners: Introduction, classification with examples and structures of :-

A) **Natural sweetners :** Carbohydrates(Glucose, Fructose)

B)**Synthetic sweeteners:** i)Sucralose, i)Sulphonamide: eg Saccharin, iii) Peptides: Aspartame, Synthesis of Saccharin . **3L**

Unit –IV

4.1: Industrial solvents:-

Manufacture and uses of ethyl acetate ,isopropyl alcohol, Acetone, Acetic acid, Dimethyl formamide, Brief idea of green solvents. **6L**

4.2 : Introduction to drugs:
Terminology,Classification with one example each. Synthesis and uses of the following :-

1) Ethambutol 2) Mebendazole 3) Benadryl 4) Ibuprofen 5) Miconidazole 6) Diazepam **6L**

4.3:Fluoroaromatics:
Introduction, important reagents used for fluorination, Halex reaction, Super Halex reaction, Preparation of ortho-fluorotoluene and 3-chloro-4-fluoro aniline.. **3L**

PRACTICALS

SEMESTER V

HEAVY & FINE CHEMICALS

COURSE CODE: USACHFC5P1 **CREDITS: 02**

Preparations: (Micro scale)

1. Preparation of Ferrous sulphate heptahydrate
2. Preparation of Aspirin
3. Green synthesis of benzillic acid from benzil

Estimations

1) Estimation of tincture iodine.
2) Estimation of methyl salicylate .(Back titration method)
3) Estimation of acetic acid in a sample of vinegar (Titrimetry)

SEMESTER VI

HEAVY & FINE CHEMICALS

COURSE CODE: USACHFC601 CREDITS: 02 LECTURES: 60

Unit –I

1.1 Refrigeration: System, media used for cold transfer (i.e. brine and other) **3L**

1.2 Different Sources of Energy: Generation, Treatment of boiler feed water, Properties of steam, steam table **3L**

a)Glass: Composition, types and applications. **3L**

1.3Manufacturing process properties and applications of : 6L

a) Sulphuric acid (Contact Process)

b) Ammonia (Haber's process)

c) Sodium hydroxide

Unit –II

21.Zeolites,Clays and Ion-exchange resins 3L

2.2Design of vessel : Classification of chemical reactors, pressure vessels for internal or external pressure, Maintenance, storage vessels for liquids and gases . **4L**

2.2 Manufacture and uses of Industrial gases : Hydrogen and Acetylene **2L**

2.3 Industrial preparation of Inorganic Fine chemicals: $KMnO_4$, $FeSO_4.7H_2O$ **2L**

2.5 Composite materials:Introduction, Constitution of composites, Classification of composites, Particle Reinforced composites, Fiber reinforced composites, Structural composites or Layered composites, Applications of composite materials**.** **4L**

Unit –III

3.1 Small Scale Industries and R and D technology: Need and scope of small scale industry, SSI rules and regulations,R and D, technology transfer, Role of R and D, Functional structure of R and D unit, Research strategies and manufacturing interface, University-Industry interface, Patents **7L**

3.2 Manufacture of soaps: Raw materials, Preparation, properties and types of soaps, Continuous process for the manufacture of soap. **2L**

3.3 Oils and Fats: Introduction, Classification, Properties of oils and fats, extraction of oils from oil seeds, hydraulic pressing and solvent extraction, extraction of animal fats, hardening of oils **4L**

3.4 Detergents: Introduction,classification, manufacture of DDBS,industrial applications **2L**

Unit –IV

4.1 Unit Operations; General idea of the following operations used in Industries; **9L**
1) Filtration: Introduction, factors affecting the rate of Filtration, Filtration processes
a) Plate and frame filter Press b) Rotary Drum filter
2)Distillation: Introduction, Distillation methods a) Bubble cap column distillation b)Fractional distillation
3) Crystallization : Introduction, Solubility, Super saturation, Nucleation, Crystal growth**,** Crystallization process , a) Agitated Tank Crystallizer, b) Swenson Walker Crystallizer
4) Centrifugation: Introduction, Centrifugation process used in Industry.

4.2: Introduction to Dyes: Dye, Chromophores (with examples), Auxochromes (with examples), Synthesis and uses of the following dyes: 1) Indigo 2) Alizarin 3) Eriochrome Black-T 4) Auramine-O 5) Procion-red 6) Congo red **6L**

PRACTICALS
SEMESTER VI

HEAVY & FINE CHEMICALS

COURSE CODE: USACHFC6P1 **CREDITS: 02**

Preparation: (Micro scale)

1. Double salt (Ferric alum)
2. Copper sulphate pentahydrate
3. Preparation of Ni-DMG complex

Estimation:

1. Determination of the amount of. phosphoric acid from a given sample using 1 - naphtholphthalein and phenolphthalein indicator.(Students to prepare succinic acid solution for standardization of NaOH).
2. Determination of the amount of magnesium hydroxide in a commercial sample of milk of magnesia.
3. Estimation of aspirin (Acid-Base titration)
4. Estimation Ibuprofen in the given sample (Back titration method)

Industrial visit: Industrial visit report is to be submitted along with the journal

Recommended Books

1. C. D. Dryden: Outlines of Chemical Technology, edited & revised by M. Gopala Rao & Marshall Sittig East West Press, New Delhi.
2. Faith Keyes and Clerk's Industrial Chemicals, 4th Edn., Wiley Inter-science 1975.
3. Foust A. S. et-al.: Principles of Unit Operations John Wiley & Sons.
4. Macabe W.L., Smith J. C. and Harriott. P. Unit Operations of Chemical Engineering (7th edition) (McGraw Hill Chemical Engineering series).
5. P. H. Groggins: Unit Processes in Organic Synthesis, McGraw Hill.
6. Kirk & Othmer: Encyclopeadia of Chemical Technology, John Wiley and sons.
7. A. I. Vogel: Text book of Quantitative Analysis including Instrumental Analysis.
8. A. I. Vogel: Text book of Quantitative Organic Analysis.
9. Industrial Inorganic Chemistry-Buchner, Schliebs, Winter, translated by D. H. Tenell, VCH Publishers, New York.
10. Industrial Organic Chemistry- K. Welssermel, H. J. Arpe, VCH Publishers, New York.
11. B.Pearson- Speciality Chemical Innovations in Industrial Synthesis.
12. Text Book of Organic Medicinal and Pharmaceutical Chemistry Wilson & Giswold
13. Text Book of Pharmacology – Satoskar & Bhandarkar.
14. The Chemistry of Synthetic Dyes – Edited by K. Venkatraman. Academic press Inc. London.
15. Shreeves 'Chemical Process Industries' 5th Edition, G. T. Oustin, McGraw Hill.
16. Industrial Chemistry- B. K. Sharma, Goyal publishing house, Mirut.
17. Riegel's Hand Book of Industral Chemistry, 9th Edition, Jems A. Kent.
18. Industrial Chemistry- E Stoch, Vol- I, Ellis Horwood Ltd. UK.
19. An Introduction to Industrial Organic Chemistry- Wiseman and Peter, ""
20. Unit Operations and Processes- P. H. Groggins.
21. Unit Operations I and II- P.P. Kale- Pune Vidyarthigruh Prakashan.
22. Unit Operations in Chemical Engineering by W. L. McCabe and Smith.
23. Riegel's Handbook of Industrial Chemistry, J. A. Kent, CBS Publishers, New Delhi
24. Riegel's Handbook of Industrial Chemistry, James A. Kent, 7th Edition, Van Nostrand Reinhold Company.
25. Shreeves 'Chemical Process Industries' 5th Edition, G. T. Austin, McGraw Hill, 1984.