DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM & MARKING SCHEME

B.Sc. Part - III

INDUSTRIAL CHEMISTRY

SESSION : 2023-24

ESTD : 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A+, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

Phone : 0788-2212030

Website - www.govtsciencecollegedurg.ac.in, Email – autonomousdurg2013@gmail.com

Syllabus

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM & MARKING SCHEME

B.Sc. PART-III

INDUSTRIAL CHEMISTRY

(OLD COURSE)

SESSION: 2023-24

ESTD : 1958

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DEPARTMENT OF CHEMISTRY

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (CG)

Approved syllabus for B.Sc. INDUSTRIAL CHEMISTRY by the members of Board of Studies for the Session

2023-24

The syllabus with the paper combinations is as under

B.Sc. III:

Paper I: CHEMICAL PROCESS AND INDUSTRIALECONOMICS	**Paper II: PHARMACEUTICALS**
Paper III : DRUGS	**Practical: INDUSTRIAL CHEMISTRY**

Note: Industrial visits/ training is mandatory for all students as part of curriculum.

The syllabus for B.Sc. –III Year Industrial. Chemistry is hereby approved for the session 2023 - 24

NAME AND SIGNATURE:

	Departmental members	
Chairperson /H.O.D	1.....	8.....
Subject Expert ..... (University Nominee)	2.....	9.....
Subject Expert.....	3.....	10.....
Representative ..... (Industry)	4.....	11.....
Representative ..... (Alumni)	5.....	12.....
Representative ..... (Professor Science Faculty Other Dept.)	6.....	13.....
	7.....	14.....

DIRECTIVES FOR STUDENTS OF B.Sc. PART- III

(INDUSTRIAL CHEMISTRY)

2023-24

EVALUATION PATTERN

Theory Paper - I : 34 marks; Paper – II & III: 33 marks

Practical: 50 marks

Question Paper Format and Distribution of Marks for Under Graduate Examination

1. The question paper for UG Classes is to be divided into three Sections - A, B &C.
2. Section A shall contain very short answer type questions (answer in one or two sentences) or objective type questions. **(No Multiple choice questions. No 'fill in the blank' typeQuestions)**
3. Section B shall contain short answer type questions with the limit of 150words.
4. Section C shall contain long answer/descriptive type questions. The students are required to answer precisely and the answer should not exceed the limit of 350words.
5. The scheme of marks should be as follows:

Question Type	MM 33 (Marks x No. of Questions)	MM 34 (Marks x No. of Questions)
A (Very shortAnswer)	8x1 = 08	1x9 = 09
B (Short Answer)	2x5 = 10	2x5 = 10
C (Long Answer)	3x5= 15	3x5= 15

6. The half yearly internal examinations will be held for Part-I, Part-II & Part III. 10% out of marks obtained by the students in each paper in internal examinations will be added to 90% of marks obtained in each paper of annual examination.

NAME AND SIGNATURE:

Chairperson /H.O.D.....	Departmental members:
Subject Expert.....	
(University Nominee)	
Subject Expert.....	
Representative.....	

B.Sc. (with INDUSTRIAL CHEMISTRY)

Programme Specific Outcome (PSO):

Upon completion of B.Sc. Degree Programme (with Industrial Chemistry), the students would be able

PSO1: To have a knowledge of history, development, fundamentals and uses of various aspects in Industrial Chemistry.

PSO2: To explain the concepts and application of chemistry in various industries.

PSO3: To acquaint with the principles/concepts/pre-requisites/management involved in industries.

PSO4: To understand the various processes of industries through theory, project and industrial visits.

PSO5: To get familiarized with safety measures in laboratory and develop skills in proper handling of chemicals and apparatus/instruments.

PSO6: To carry out experiments, record the observations and present the inference/results.

NAME AND SIGNATURE:

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Subject Expert ..... (University Nominee)	1.....	8.....
Subject Expert.....	2.....	9.....
	3.....	10.....
Representative ..... (Industry)	4.....	11.....
	5.....	12.....
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Representative ..... (Professor Science Faculty Other Dept.)	7.....	14.....

Syllabus and Marking Scheme for Third Year

2023-24

Paper No.	Title of the Paper	Marks Allotted in Theory	
		Max	Min
I	CHEMICAL PROCESSAND INDUSTRIALECONOMICS	34	11
II	PHARMACEUTICAL CHEMISTRY	33	11
III	DRUGS	33	11
IV	Practical	50	17
	Total	150	

03 Theory papers	-	100
01 Practical	-	50
Total Marks	-	150

Note:

- The half yearly internal examinations will be held. 10% out of marks obtained by the students in each paper in internal examinations will be added to 90% of marks obtained in each paper of annual examination.
- Industrial visits/ training is mandatory for all students as part of curriculum.

The syllabus for B.Sc. Ind. Chemistry is hereby approved for the session 2022- 23

NAME AND SIGNATURE:

Chairperson /H.O.D.....	Departmental members:
Subject Expert.....	
(University Nominee)	
Subject Expert.....	
Representative.....	

DEPARTMENT OF CHEMISTRY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (CG)
B. Sc. III (INDUSTRIAL CHEMISTRY)
2023-24
PAPER- I

CHEMICAL PROCESS AND INDUSTRIAL ECONOMICS

Course Outcome (CO):

After completion of the course, the students would be able:

CO1: To gain knowledge of the process of estimating the costs associated with completing a project within scope and according to its timeline.

CO2: To understand about various resources for fixed assets and land andgain knowledge regarding start-up.

CO3: To determining the real value of assets and fixing right price for products.

CO4: To develop ability to calculate profit.

CO5: To learn about management skills and become efficient managers.

CO6: To deal with controlling and regulating the flow of material in relation to changes in variables like demand, prices, availability, quality, delivery schedules etc.

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B. Sc. III (INDUSTRIAL CHEMISTRY)
2023-24

PAPER- I

CHEMICAL PROCESS AND INDUSTRIAL ECONOMICS

Max. Marks – 34

UNIT-1

1. Factors involved in project cost estimation, methods employed for the estimation of capital investment.
2. Capital formation, elements of cost accounting.

UNIT-2

1. Interest & investment cost, time value of money equivalence.
2. Depreciation, method of determining depreciation, taxes.
3. Some aspects of marketing, pricingpolicy.

UNIT-3

1. Profitability criteria, economics of selecting alternatives
2. Variation of costs with capacity. Break - even point, optimum batch sizes, Production, scheduling etc.
3. Sampling of Bulk materials, techniques of sampling of solids, liquids and gases.
4. Collection & processing data.
5. Particle size determination.
6. Rheological properties of liquids, plastics and their analysis.

UNIT-4

Industrial Organization

1. Concept of scientific management in industry.
2. Functions of management, decision making, planning, organizing, directing &control.
3. Location of industry.

UNIT-5

1. Materials management.
2. Inventory control.
3. Management of human resources - Selection, incentives, Welfare & safety.

REFERENCE BOOKS:

1. Industrial Organization & Management, Bethal ,L.L.
2. Industrial Organization & Management, Tarachand , Vol.I&II.
3. Book on Management , Khandelwal, O.P.
4. Rheology Theory & Application, Vol , 5, Elrich ,R.F.
5. Economics of Chemical Industry, Hempel , E.H.
6. Plant Design & Economics for Chemical Engineers , Peter Time Rhaus, Mc GrawHill.
7. I.C.M.A. Booklets -9&10

Question Paper Format and Distribution of Marks for Under Graduate Examination

1. The question paper for UG Classes is to be divided into three Sections - A, B &C.
2. Section A shall contain very short answer type questions (answer in one or two sentences) or objective type questions. **(No Multiple choice questions. No 'fill in the blank' typeQuestions)**
3. Section B shall contain short answer type questions with the limit of 150words.
4. Section C shall contain long answer/descriptive type questions. The students are required to answer precisely and the answer should not exceed the limit of 350words.
5. The scheme of marks should be as follows:

Question Type	MM 34 (Marks x No. of Questions)
A (Very ShortAnswer)	1x9 = 09
B (ShortAnswer)	2x5 = 10
C (Long Answer)	3x5= 15

NAME AND SIGNATURE:

Chairperson /H.O.D..... Subject Expert..... (University Nominee) Subject Expert.....H. Mahabey Representative.....	Departmental members:

B. Sc.- III (INDUSTRIAL CHEMISTRY)
2023-24

PAPER- II
PHARMACEUTICALS

Course Outcome (CO):

After completion of the course, the students would be able:

CO1: To correlate and compare historical background/development of Indian and other important pharmacopoeias and understand formulations/routes of administration/aseptic conditions/sterilization and need for sterilization in pharmaceuticals.

CO2: To describe the manufacture and quality specifications of pharmaceutical excipients/additives and applications of sutures, ligatures in surgical dressing.

CO3: To acquaint with the packaging/ancillary materials, machinery and important legal aspects of food and drugs industry.

CO4: To explain and compare the various statistical tools, testing methods employed for pharmaceutical quality control.

CO5: To understand fundamentals and applications of crystallization, distillation, extraction techniques and various chromatographic techniques like paper HPLC, GLC, TLC, column and ion chromatography for evaluation/identification of crude drugs.

CO6: To describe the principle and applications of UV-Visible, IR, AAS, NMR spectroscopy, Flame photometry, X-Ray Fluorescence and Ion Selective Electrodes in pharmaceuticals.

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B. Sc. III (INDUSTRIAL CHEMISTRY)

2023-24

PAPER- II
PHARMACEUTICALS

Max. Marks – 33

UNIT- 1

1. Historical background & development of pharmaceutical industry in India inbrief.
2. Pharmacopoeias - Development of Indian pharmacopoeia & introduction of B.P., U.S.P., E.P., N.F & other importantPharmacopoeias.
3. Introduction to various types of formulations & routes ofadministration.
4. Asepticconditions, need for sterilization, various methods ofsterilization.

UNIT- 2

1. Various types of pharmaceutical excipients, their chemistry, process of manufacture & quality specifications. Glidants, lubricants, diluents, preservatives, antioxidants, emulsifying agents, coating agents, binders, coloring agents, flavouring agents, gelatin and other additives, sorbitol, mannitol, viscosity buildersetc.
2. Surgical dressing, sutures, ligatures with respect to the process, equipments used for manufacture, method of sterilization and quality control.

UNIT- 3

1. Pharmaceutical packaging introduction, package selection, packaging materials, ancillary materials, packaging machinery, quality control of packagingmaterials.
2. F.D.A. Important schedules & some legal aspects ofdrugs.
3. Pharmaceutical quality control (other than analytical methods covered under core subject) sterility testing, pyrogenic testing, glass testing, bulk density of powdersetc.

UNIT- 4

1. Evaluation of crude drugs - Moisture content, extractive value, volatile oil content, foreign organic matter, quantitative microscopic exercises, including starch, leaf content, (palisade ratio stomatal number & index vein, islet number & vein termination number) crude fiber content introduction to chromatographic method for identification of crudedrugs.
2. Chromatography: Paper chromatography, TLC, HPLC,GLC.
3. Ionchromatography.

UNIT-5 INSTRUMENTATION

1. UV-Visiblespectroscopy
2. IR- Spectroscopy non - dispersiveIR
3. NMRSpectroscopy
4. Atomic absorption & Flamephotometry
5. X-RayFluorescence
6. Ion SelectiveElectrodes
7. NeutronDiffraction

REFERENCE BOOKS :

1. Instrumental methods of analysis, Willard, Merit,Dean.
2. Introduction to instrumental methods of analysis, Braun,R.D. Mc GrawHill.
3. Analytical chemistry, J.B. Dick , McGraw .Hill.
4. Quantitative Inorganic analysis, A.Vogel.
5. Instrumental methods of analysis, Skoog &West.
6. Instrumental methods of analysis, B.K. Sharma.
7. Practical Pharmacognosy, T.B.Wills
8. Practical Pharmacognosy, T.N.Vasudevan
9. Modern Pharmacognosy Remstad, Mc GrawHill
10. Indian Pharmacopoiea,1985
11. British Pharmacopoiea,1990
12. Hand Book of Drugs and Cosmetic Act.,Mehrotra
13. Pharmaceutical excipients
14. Pharmaceutical Dosage forms.

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B (ShortAnswer)	2x5 = 10
C (Long Answer)	3x5= 15

NAME AND SIGNATURE:

Chairperson /H.O.D..... Subject Expert..... (University Nominee) Subject Expert..... Representative.....	Departmental members:

B. Sc. III (INDUSTRIALCHEMISTRY)

2023-24

PAPER- III
DRUGS

Course Outcome (CO):

After completion of the course, the students would be able:

CO1: To learn classification of crude drugs and manufacture of sulpha drugs.

CO2: To have knowledge of chemical constitution of plants and isolation procedures for active ingredients for alkaloids.

CO3: To get an introductory idea of Antimicrobial, Analgesic Barbiturates Blockers and Cardiovascular drugs.

CO4: To understand the structure, function, deficiency disease caused by steroidal hormones and vitamins.

CO5: To know about fermentation process and product processing.

CO6: To gain insight into manufacture of antibiotics.

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B. Sc. III (INDUSTRIALCHEMISTRY)

2023-24

PAPER- III
DRUGS

Max. Marks – 33

UNIT- 1

1. Phytochemicals - Introduction to plant classification & crude drugs,cultivation, collection, preparations for the market &storageof medicinal plants.
2. Classification of various types of drugs withexamples.
3. Raw materials, process of manufacture, effluent handling, etc of the following bulk drugs: Sulpha drugs - sulphaguanidine,sulphamethoxazole.

UNIT- 2

1. Chemical constitution of plants including carbohydrates, amino acids, proteins, fats, waxes, volatile oils, terpenoids,steroids,saponins flavonoids, tannins, glycosides,alkaloids.
2. Various isolation procedures for active ingredients with examples for alkaloids reserpine, one for steroids - sapogenin, diosgenin, diogron.

UNIT- 3

1.Antimicrobial: Chloramphenicol, Furazolidne, Mercurochrome, isoniazid, Na-PAS.
2. Analgesic - Antilnflammatory: Salicylic acid and its derivatives, lbuprofen, Mefenamicacid.
3. Steroidal Hormones: Progesterone, Testosterone, Methyltestosterone

UNIT-4

1. Vitamins: Vit. A, Vit.-B6 and Vit -C
2. Barbiturates: Pentabarbital
3. Blockers – PropranololAtenolol
4. Cardiovascular Agent -Methyldopa
5. Antihistamins - Chloropheneraminemelate

UNIT-5

1. Products based on fermentation processes: Brief idea of micro organisms, their structure, growth & usefulness. Enzyme systems useful for transformation, microbial products.
2. General principles of fermentation processes & productprocessing.
3. Manufacture of antibiotics - Penicillin - G & semi synthetic penicillin, Rifamycin, Vitamin -B12
4. Bio transformation process for prednisolone, 11-hydroxylationin steroids.
5. Enzyme catalysed transformation, manufacture ofephidrine.

REFERENCE BOOKS:

1. Practical Pharmacognosy, T.B.Wills
2. Practical Pharmacognosy, T.N.Vasudevan
3. Modern Pharmacognosy Remstad, Mc GrawHill
4. Indian Pharmacopoea,1985
5. British Pharmacopoea,1990
6. Hand Book of Drugs and Cosmetic Act.,Mehrotra
7. Pharmaceutical excipients
8. Pharmaceutical Dosage forms.
9. Principles of Medicinal Chemistry, W.O. Foye, Lea & Febigen, Publication Philedelphia.
10. Essentials of Medicinal Chemistry, Korolkovas&Burkhatter, WileyInterscience.
11. Text book of Organic Medicinal and PharmaceuticalChemistry,Wilson, Gisvold, Derge, Lippinett-Toppan.

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B. Sc. III (INDUSTRIAL CHEMISTRY)
PRACTICAL

Duration of Examination: 08 hrs. **Max. Marks –50**

Two experiments have to be performed

1. Synthesis of common industrial compounds involving two - stepreactions.
   4 - bromoaniline, 3-Nitro aniline, Sulphanilamide, 4- Aminobenzoic acid,
   5 -- Nitrobenzoic acid , dihalobenzenes,Nitrohalobenzenes.
2. Industrial analysis of common raw materials as per industrial specification: Phenol, Aniline, Formaldehyde, Hydrogen peroxide, Acetone, Epoxide,Olefins, oilsetc.
3. Demonstration of various pharmaceutical packaging materials, quality control tests of some materials, - A1 Strips, Cartons, Glassbottles
4. Limit tests for chlorine, heavy metals, arsenic etc. of two representative bulk drug.
5. Demonstration of various pharmaceutical products.
6. Active ingredient analysis of few types of formulations representingdifferent methods of analysis - acidimetry, alkalimetry, non-aqueous.
7. Determination of sulphate ash, loss of drying & other tests of bulk drugs, complete I P monograph of three drugs representing varietyoftesting methods.
8. Evaluation of crude drugs - macroscopic examination, determination & identification of starch granules, calciumoxalate.
9. Palisade ratio, stomatal index -determination and identification of few drugs, TLC method foridentification.
10. Microbiological testing determination of mic of some antibacterial drugs by zone /cup plate method.
11. Spectrophotometric estimation of drugs – ciprofloxacin, paracetamol, etc.
12. Preparation of pharmaceutical formulations like cream, suspension and emulsions.
13. Determination of saponification value of oil/polymeric materials.
14. Determination of iodine value of oil/polymeric materials.
15. Quantitative analysis of jewelry.
16. Determination of ash content in polymeric substance.

DISTRIBUTION OF MARKS

1	EXPERIMENT NO . 1	-	20
2	EXPERIMENT NO. 2	-	10
3.	VIVA	-	05
4 .	SESSIONAL	-	05
5	PROJECT WORK	-	10
	TOTAL	-	**50**

NAME AND SIGNATURE:

	Departmental members	
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Representative ..... (Professor Science Faculty Other Dept.)		