P. R. GOVERNMENT COLLEGE (A) KAKINADA
(Affiliated to Adikavi Nannaya University)

DEPARTMENT OF CHEMISTRY

B. Sc Chemistry Syllabus under CBCS

\

Board of Studies
2018-19

P.R.Govt. College (A), Kakinada

Recommended Composition of the Board of Studies of Chemistry

And it' s Functions of an Autonomous College

April-2018-19

I Composition

1. **Head of the Department concerned (Chairman):**

   Sri T. Vara Prasad, M.Sc., M.Phil, M.Ed (Ph.D)

2. **The entire faculty of each specialization.**

   1. Sri D.Rama Rao, M.Sc., B. Ed., M.Phil.
   2. Sri V.Mallikarjuna Sarma,MSc, M.Phil,NET

3. **Two experts in the subject from outside the college to be nominated by the Academic Council**

   1. Dr. V .Sambasivarao, Lecturer in Chemistry, Arts College, Rajahmundry
   2. Dr. K . Jhansi Lakshmi, Lecturer in Chemistry, Ideal Degree College, Kakinada

4. **One expert to be nominated by the Vice-Chancellor from a panel of six recommended by the College Principal**

   1. Prof. K. Deepti, Adikavi Nannaya University, Rajahmundry

5. **One representative from industry/ Corporate Sector/ allied area relating to Placement.**

   1. Ch. V. N. S. Vara Prasad, Managing partner, DAS Pharma Ltd, Kakinada

6. **One postgraduate meritorious alumnus to be nominated by the Principal.**

   The chairman, Board of Studies, may with the approval of the Principal of the College, Co-opt.

   1. Sri. Nemani Ramam, M.Sc., M.Phil

II. Term.

The term of the nominated members shall be two years.

III. Meeting

The Principal of the College shall draw the schedule for meeting of the Board of Studies for different Departments. The meeting may be scheduled as and when necessary but at least once a year.

IV. Functions

The Board of Studies of a Department in the College shall:

a) Prepare syllabus and various courses keeping in view the objectives of the College interest of the stakeholders and national requirement for consideration and approval of the Academic Council.
b) Suggest methodologies for innovative teaching and evaluation techniques.
c) Suggest panel of names to the Academic Council for appointment of examiners.
d) Coordinate research, Teaching, Extension and other academic activities in the Department/College.

<u>Signatures of the members who attended the</u>

<u>Board of studies in Analytical Chemistry on 07.04.2018 at 2.00pm</u>

1. Sri T. Vara Prasad — Chairman & Lecturer in Charge

2. Dr. K. Deepti, — University representative
   Adikavi Nannaya University
   Rajamahendravaram

3. Ch. V. N. S. Vara Prasad, Managing partner, DAS Pharma Ltd, Kakinada

4. Dr. V. Sambasivarao, — Subject expert
   Lecturer in Chemistry,
   Govt. Arts College,
   Rajamahendravaram

5. Dr. K. Jhansi Lakshmi — Subject expert
   Lecturer in Chemistry,

Ideal Degree College, Kakinada

6. Sri. N. Ramam — Alumnus, Principal, Retd.
7. Sri D. Rama Rao — Member
8. Sri V. Mallikarjuna Sarma — Member

ACTION PLAN BOS MEETING -CHEMISTRY HELD ON 07 -04-2018.

1. Department activities for 2018-2019 academic year. Annexure I

Month	Activity proposed	Faculty member in charge
June-18	Departmental staff meeting to review results and class work allotment	T. Vara Prasad
	Preparation of curricular plans, time-tables etc.,	
	Remedial coaching classes for II & III year supplementary exams	
	Bridge classes for I year students	
July-18	Student awareness programmes on ragging& eve teasing - consequences , self-discipline, career guidance, higher education opportunities etc.,	T.Vara prasad
August-18	Conference on prospects in pharmaceutical industries	T. Vara Prasad

	Study tour / Field trips	
Sept-18	Ozone day	
Oct-18	MOLE Day	D.Ramarao
	Faculty development programme	V.Mallikarjuna sarma
Nov-18	11th National Education Day – Out reach Programme to nearby school	
Dec-18	World AIDS Day	
	Chemistry day & Chem fest	V.Mallikarjuna sarma
Jan-19	10 days coaching for PG entrance examinations in chemistry Study tour / Field trips	V.Mallikarjuna sarma
Feb-19	NATIONAL SCIENCE DAY	V.Mallikarjuna sarma
March-19	Consumer awareness day	T. Vara Prasad

2. Organizing National/ State level seminars/Workshops/ Conferences/ Training programmes etc., with topics and other details.

(Mandatory for each Department)

i) Staff development programme
ii) Training in the use of HPLC
iii) Awareness on OZONE protection
iv) National Chemistry day
v) Chem. fest
vi) National Science day 2019
vii) Guest lectures
viii) National seminar in chemistry
ix) Training in Soil analysis
x) Training in water analysis
xi)

3. Change of modules in the syllabus content.

Syllabus changed for first and second years as per university regulations. CBCS introduced for final year w.e.f. 2018-19.

4. **Plan for utilization of funds for Autonomous/CPE/other grants available for arranging guest lectures, faculty improvement programmes, study tours, equipping laboratories, reference books& other necessary teaching-learning material with ICT enabled teaching.**

I. **Study visits to:** **Rs, 50,000**

1. Visakha Steel Plant, Visakhapatnam
2. Hetero Laboratories, Nakkapally
3. Dr. Reddy' s Laboratories, Yanam.
4. National Institute of Hydrololgy, Kakinada.
5. SAR Chandra Environ Solutions, Kakinada.
6. ONGC mini refinery, Tatipaka.
7. Soil analysis laboratory, Samalkot.
8. IICT,HYD
9. Venky parenterals, Yanam

II.

1. Sophisticated version UV-Visible spectrophotometer- 5.0 lakhs
2. Other equipment 1.0 lakhs
3. Petrochemicals equipment 1.0 lakhs

5. **Plan for organizing subject oriented community outreach programmes & allocation of necessary funds. (Mandatory for each Department)**

i) Adoption of village Rs. 20,000

ii) Medical Awareness programmes Rs. 10,000

6. **Institution of new medals/incentives/prizes etc., from alumni, philanthropists, parents, faculty etc., - Strategies to be recommended**

---

7. **Introduction of new programmes – PG/UG/Diploma and certificate courses.**

New courses to be proposed.

S.No.	New course proposed	Justification	Employability
1	Under graduate course in Industrial chemistry	There is dearth of skilled persons to operate various instruments like	Technical assistants, Quality

		uv visible spectrophotometer, Atomic absorption spectrophotometer, PH meter, flame photometer, rotavapour instrument, HPLC.GLC, distillation, etc which play as key role in any industry related to chemistry.	control managers, Plant supervisors etc.

8. **Any other programme that enhances the learning capacity of students and their employable & knowledge skills.**

   Training in the use of instruments like AAS, UV-Vis, HPLC, flame photometer, uranium analyzer, soil and water analysis projects, air quality projects.

9. **Change in internal assessment exams for conducting II mid Semester by way of Project work/Assignment.**

   Not possible as the number of students is more. However it is propose to give 33.3% weitage for competitive exam questions pertaining to the syllabus prescribed.

10. **Suggest panel of examiners/paper setters & other experts/nominees for BOS deliberations.**

Chemistry:

1. Sri N. Lakshmana Rao, SKBR College, Amalapuram.
2. Dr. D. Madhava Sarma, GDC,Tadepalligudem
3. Dr. V. Sambasiva Rao, Govt.Arts College, Rajahmundry.
4. Dr. K. A.R.S.S.Prasad, VS Krishna College, Visakhapatnam.
5. Sri S.V. Ramana , Arts College, Rajahmundry
6. Sri Machi Raju, Arts College, RajahmundrY
7. Smt. C. Jyoti, St.Therisa college,Eluru.
8. P. Krishna kumar,S.K.B.R.College,Amalapuram.
9. Dr. G. Venkatarao,GDC,Vijayavada
10. Shri B.Venkatarao, GDC,Tadepalligudem
11. Dr.Ramchadarao,Y.N.College,Narasapuram

Department of Chemistry BOS Meeting Dt.07 -04-2018

Resolutions:

Meeting of Board of studies in chemistry is convened on 07-04-18 in the guest room of the College. The Principal Dr. Chappidi Krishna, Dr.K.Deepthi , University Nominee , Ch. V. N. S. Vara Prasad, Managing partner, DAS Pharma Ltd, Kakinada, Dr.V.Sambasiva Rao , Subject Expert, Govt. Degree College, Tuni, Dr. . Jhansi Lakshmi, Lecturer in Chemistry, Ideal College, Kakinada. , all members of the faculty of Chemistry and student representatives attended the meeting. Agenda items are discussed and resolutions are made.

1. It is resolved to continue Choice based credit system in the Chemistry combination programmes as per the directions of the CCE, Hyderabad to the first year and second year and final year students w.e.f. 2018-19
2. Enhance the internal assessment component from 30% to 40% in theory to first year (admitted batch) extended to second year also.
3. It is resolved to allot project works for final year students who opt for project work in chemistry preferably industry based.
4. It is resolved to conduct departmental activities such as Ozone day, Chem fest, Chemistry day and Science day etc.
5. It is resolved to offer subject electives and skill based electives in the V and VI semesters respectively.
6. It is resolved to implement the recommended Pedagogy for the first semester 2018-19.
7. Resolved to conduct practical examinations semester wise.

   The following paper setters are recommended.

   i. Dr. V.Sambasiva Rao, Govt.Arts College, Rajahmundry.
   ii. K.A.R.S.S.Prasad, VS Krishna College, Visakhapatnam.
   iii. Sri S.V.Ramana , Arts College, Rajahmundry
   iv. Sri Machi Raju, Arts College, Rajahmundry.
   v. U. Satyanarayana, GDC, Tuni
   vi. R. Brahmaji, GDC, Ramachandrapuram
   vii. N. V. Sudhakar, GDC, Tuni
8. It is resolved to organize Guest lectures by eminent professors.
9. Resolved to implement pass minimum for internal assessment for CBSE pattern students as the pattern is learner oriented.
10. NEW COURSES:

    It is resolved to explore the possibility of introducing a new course in B.Sc Pharmaceuticals/Industrial Chemistry as Restructed course.

.11. Resolved to submit proposals to conduct a faculty development programme in instrumentation techniques/ advanced topics with the assistance of industry representatives and university representatives.

12. Resolve to assist the orphan children of below two years age being taken by department of Women and Child Welfare as an extension activity with the funds contributed by the faculty members of the department.
13. Resolved to change the syllabus components in semester I to semester II and vice versa. Sly, Semester III to IV and vice versa on par with the affiliating university.
14. It is proposed to give 33.3% weitage for competitive exam questions pertaining to the syllabus prescribed.

New Courses

15. It is resolved to explore the possibility of introducing a new course in bsc analytical chemistry ,maths,chemistry as per the Govt./CCE order w.e.f 2018-2019.
16. Resolved to submit proposals to conduct a faculty development programme in instrumentation techiniques/ advanced topics with the assistance of the industry representatives and university representatives.
17. Resolved to assist the orphan children of below two years age being taken by department of women and child welfare as an extension activity with the funds contributed by the faculty members of the department.
18. .resolved to change the syllabus components in semester **I** to Semester **II** and vice versa. Sly semester **III** to **IV** and vice versa on par with the affiliating university.
19. it is proposed to give 33.3% weitage competitive exam questions pertaining to the syllabus prescribed

Special Features of Chemistry Department

20. In the cluster system 74 students opted chemistry projrcts andthey were submitted projects to our college under the guideance of eminemt lecturers.
21. NAAC team visited our college chemistry department on 08-09-2017 and chairman was commented **" chemistry department is very good"** in always.
22. CCB academic team visited our chemistry department on 21-03-2018 and team head was commented as **" chemistry department is excellent"** in always.

Modern Lecture Methods & New Techniques

23. Power Point Presentation / LCD Teaching.
24. Virtual Class Teaching Methods.
25. Feedback on Teaching Performance.

Error 1-1.5% : 8 marks

Error >2% : 5 marks (Minimum marks)

iv) Correct calculation : 3 marks

Splitting of Practical marks for Organic compound functional group reactions:

Any **FOUR** reactions of the given functional group : (4x3)=12 marks

SEMESTER-IV

CHEMISTRY PAPER-II

SPECTROSCOPY & PHYSICAL CHEMISTRY 60hrs(4hrs/week)

OBJECTIVES:

1.Understands heterogeneous equilibria and the application of phase rule

2.Gains knowledge of principles of electrolysis and galvanic cells.

3.Understands the application of colligative properties in the determination of molecular weight.

4.Understands the application of spectrophotometry and spectroscopic interpretations.

SPECTROSCOPY 6 hrs

UNIT-I

General features of absorption-Beer-Lambert' s law and its limitations. Transmittance, Absorbance and molar absorptivity. Single and double beam spectrophotometers. Application of Beer-Lambert' s law for quantitative analysis of (i)Chromium in $K_2Cr_2O_7$ (ii)Manganese in $MnSO_4$

Electronic Spectroscopy: 8 hrs

Interaction of electromagnetic radiation with molecules and types of molecular spectra. Energy levels of molecular orbitals (σ,π,n). Selection rules for electronic spectra. Types of electronic transitions in molecules, effect of conjugation. Concept of chromophore and auxochrome

UNIT-II

Infra red spectroscopy: 8 hrs

Different regions in infra red radiations. Modes of vibrations in diatomic and poly atomic molecules. Characterisitic absorption bands of various functional groups. Interpretation of spectra-Alkanes, Aromatic alcohols, carbonyls and amines with one example to each

Proton magnetic resonance spectroscopy (^{1}H-NMR) : 8 hrs

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals, spin-spin coupling, coupling constants. Applications of NMR with suitable examples-ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone

PHYSICAL CHEMISTRY 30hrs(2hrs/week)

UNIT-III

Dilute Solutions: 10 hrs

Colligative properties, Raoult' s law, relative lowering of vapour pressure, its relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determination. Osmosis, osmotic

pressure, experimental determination. Theory of dilute solutions. Determination of molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties-Vant Hoff' s factor

UNIT-IV

Electrochemistry-I 10 hrs

Specific conductance, equivalent conductance. Variation of equivalent conductance with dilution. Migration of ions, Kohlrausch' s law. Arrhenius theory of electrolyte dissociation and its limitations. Ostwald' s dilution law. Debye-Huckel-Onsagar' s equation for strong electrolytes(elementary treatment only). Definition of transport number, determination by Hittorfs method. Application of conductivity measurements – conductometric titrations.

UNIT-V

1.Electro chemistry-II 4 hrs

Single electrode potential, sign convention, Reversible and irreversible cells, Nernst equation. Reference electrode, Standard Hydrogen electrode, Calomel electrode, Indicator electrode, metal-metal ion electrode, Inert electrode, Determination of EMF of cell, Applications of EMF measurements-Potentiometric titrations.

2.Phase rule 6 hrs

Concept of phase, components, degrees of freedom. Thermodynamic Derivation of Gibbs phase rule. Phase equilibrium of one component system-water system. Phase equilibrium of two component system. Solid-liquid equilibrium. Simple eutectic diagram of Pb-Ag system, simple eutectic diagram, desilverisation of lead, NaCl-water system, Freezing mixtures.

List of Reference Books

1.Spectroscopy by William Kemp

2.Spectroscopy by Pavia

3.Organic Spectroscopy by J.R.Dyer

4.Modern Electrochemistry by J.O.M.Bockris and A.K.N.Reddy

5.Advanced Physical Chemistry by Atkins

6.Introduction to Electrochemistry by S.Glasstone

7.Elementary Organic spectroscopy by Y.R.Sharma

8.Spectroscopy by P.S.Kalsi

IV – SEMESTER CHEMISTRY Paper-II

Weightage to content

S.No	Course content	Essay	Short questions	Total no.of questions	Total No. of Marks allotted to each Unit
	SPECTROSCOPY				
1	UNIT-I	2	2	4	30
2	UNIT-II	2	2	4	30
	PHYSICAL CHEMISTRY				
3	UNIT-III	1	1	2	15
4	UNIT-IV	1	1	2	15
5	UNIT-V	2	2	4	30
	TOTAL	**8**	**8**	**16**	**120**

LABORATORY COURSE-IV

Practical Paper-IV Physical Chemistry and IR Spectral Analysis

(At the end of semester IV)

30 hrs (2hrs/w)

Physical Chemistry **25 marks**

1.Critical Solution Temperature : Phenol-Water system

2.Effect of NaCl on critical solution temperature in Phenol-water system

3.Determination of concentration of HCl conductometrically using standard NaOH solution.

4.Determination of concentration of acetic acid conductometrically using standard NaOH Solution.

IR Spectral Analysis **10 marks**

5.IR Spectral Analysis of the following functional groups with examples

a)Hydroxyl groups

b)Carbonyl groups

c)Amino groups

d)Aromatic groups

SCHEME OF VALUATION FOR SEMESTER-IV CHEMISTRY LABORATORY COURSE

PHYSICAL CHEMISTRY & IR SPECTRAL ANALYSIS

Max.Marks:50 **Time:3hrs**

For Record - 10 marks

For Viva-voce - 5 marks

For Practical - 35 marks

Splitting of Practical Marks for Physical Chemistry :

i) Procedure in first five minutes : 5 marks
ii) Tabulation of the readings : 5 marks
iii) Calculation : 5 marks
iv) For result : 10 marks

Error <10% : 10 marks

Error 10-15%: 8 marks

Error >20% : 5 marks(minimum marks)

Splitting of Practical Marks for IR spectral analysis:

Identification of the frequencies of the bonds present in the IR spectrum of an organic compound : 10 marks

SEMESTER-IV Chemistry model question paper 2018-19

SPECTROSCOPY & PHYSICAL CHEMISTRY

(Revised Question paper w.e.f.2018-19)

Time:2½ hrs Marks:60

Answer **two** questions from SECTION-A, **two** questions from SECTION-B . Each question carries 10 marks.

SECTION-A (Spectroscopy) 2X10=20M

1. What is Spectrophotometry and Spectrophotometer? Explain various types of spectrophotometers.

2. i)Explain the selection rules for electronic spectra.

(ii)What are Electronic Transitions? Explain various types of Electronic transitions.

3. Explain the interpretation of IR spectra with any five examples.

4. Explain the principle of NMR spectroscopy?Explain their examples to the following molecules i)1,1,2,-tri bromo ethane ii)Toulene iii)Acetophenone

Section – B (Physical chemistry) 2X10=20M

5. What are the colligative properties ? and determine the elevation of boiling point by Cottrel' s method.

6. State the main postulates of Debye-Huckel theory of strong electrolytes. Explain ' relaxation effect' and ' electrophoretic effect' from it. Write Debye-Huckel-Onsager equation.

7. i)Explain about Hydrogen electrode and Calomel electrode.

(ii)Write the principles and uses of Potentiometric titrations

8. Describe Pb-Ag system, with the help of phase diagram.

SECTION-C 4X5=20M

Answer any **four** questions. Each question carries 5 marks.

9. Explain the following (i)Transmittance and (ii)Absorbance

10. Explain (i)chromophore and (ii)Auxochrome

11. Explain absorption bands of various functional groups.

12. What is Chemical Shift? How it is calculated?

13. Define Van' t Hoff factor. Explain Van' t Hoff theory of dilute solutions.

14. Define specific conductance and equivalent conductance. And Explain variation of equivalent conductance with dilution.

15. Explain about Reversible and irreversible cells.

16. What is congruent and incongruent melting point-Give one example each?

SEMESTER-V

Paper - V (INORGANIC, PHYSICAL & ORGANIC CHEMISTRY)

45 hrs (3 h / w)

OBJECTIVES:

1. Gains knowledge on crystal field splitting in complexes.

2. Knowledge of spectral data of complexes.

3. Synthesis of Heterocyclic compounds.

4. Applications of Thermodynamics.