original

P.R. Government College (Autonomous)

Kakinada

(Affiliated to Adikavi Nannaya University)

Inspiring Tomorrow College Chemists

Department of Chemistry

B. Sc., Analytical Chemistry (Hons)

Board of Studies

2025-2026

PROCEEDINGS OF THE PRINCIPAL (FAC), PITHAPUR RAJAH's GOVT. COLLEGE [A], KAKINADA
Present: Dr. Kandula Anjaneyulu, M.A, Ph.D.

Rc.No.9/A.C/BOS/2025-26 **Dt.31 July 2025**

Sub: Pithapur Rajah's Government College[A] Kakinada--Academic Cell- Conduct of BOS Meetings for the Academic Year 2025-26 - Guidelines issued - Regarding.

ORDER:

The autonomous colleges, in alignment with their vision, mission, stated objectives, and core values, are mandated to design and develop their own outcome-based curricula. This must be done with due consideration for societal, local, and global industry requirements, employability, and the development of industry-ready and transferable skills. Accordingly, every programme shall prescribe Course Outcomes (COs), Programme Outcomes (POs), and Programme Specific Outcomes (PSOs) along with a suitable learning outcome assessment management system, supported by a robust and transparent evaluation mechanism to measure attainment levels among students.

Further, the A.P. State Council of Higher Education (APSCHE) has introduced a revised curricular framework effective from the Academic Year 2025-26, incorporating Skill Enhancement Courses, Multi-Disciplinary courses, the Indian Knowledge System and a revised credit structure.

Our institution, from the Academic Year 2022–23 onwards, has defined a renewed vision and mission along with updated objectives and core values, necessitating the design and reorientation of its academic and research administration in line with these directives.

In light of the above responsibilities prescribed by the institution's vision and mission, NEP–2020, NAAC, NIRF, and the APSCHE's revised and new UG and P.G. curricular framework, it is imperative to customize, design, and re-orient our academic and research activities to meet the expectations of students, industries, and government stakeholders.

Accordingly, the Chairpersons of the U.G and P.G Boards of Studies (BoS) of various departments are hereby requested to make necessary arrangements to convene their BoS meetings before **09 Aug 2025.**

The Chairpersons are further instructed to:

1. Prepare the curricula and extracurricular activities for the Academic Year 2025–26 in line with the institution's vision, mission, NEP–2020, and NIRF norms.
2. Devise an appropriate evaluation system to ensure effective learning outcomes and holistic student development.
3. Ensure that the curriculum design includes a mandatory *20% revision* of the syllabus each year without deviating from the APSCHE prescribed syllabus.
4. If the syllabus is not prescribed by APSCHE/Affiliating University, then the syllabus is to be

framed by the BOS committee concerned with duly following the mandate prescribed above.

5. Engage stakeholders viz employers, parents, and alumni, to obtain feedback on the existing curricula and to invite suggestions for improvements.
6. Invite the University nominee, subject experts, industry representatives, student representatives, and parent representatives well in advance. The meeting notice shall clearly specify the date, venue, and agenda, and a soft copy of the agenda and relevant documents shall be circulated for their perusal.
7. Ensure that the subject experts invited preferably hold a Doctorate with at least 10 years of teaching experience and have relevant expertise in designing industry-related, market- and job-oriented curricula.
8. Facilitate thorough deliberations on curriculum design, evaluation methods, incorporation of research components, measures to enhance learning experiences, and optimal utilization of existing human, physical, and ICT resources.
9. Conduct all BoS meetings in offline mode. Online participation shall be permitted only under exceptional circumstances.
10. Prescribe benchmarking and quality initiatives in pedagogy and learning, including strategies for curriculum design and teaching-learning processes, in collaboration with the IQAC Coordinator, prior to the BoS meeting.
11. Ensure that a minimum student attendance of **75%** shall be required for eligibility to appear for I & II Mid-Term Examinations under the CIA component; this shall be formally approved in the BoS meeting.
12. Approve any new programmes to be introduced for the Academic Year 2025–26, the number and frequency of certificate courses, and SWAYAM MOOCs courses.
13. Submit the approved BOS copies in the prescribed format, in **quadruplicate (hard copies)** to the Academic Cell for onward submission to the IQAC, Examination Cell, and Library, within **three days** of the meeting and upload the soft copy in their respective department web pages in the college website.
14. Ensure strict alignment of all recommendations and curriculum changes with the institution's vision and mission.
15. Submit a request to receive advance funds from the Examination cell through Principal for conducting BoS meetings.

The details of honorarium to be paid to the University Nominee and Subject Experts attending the Board of Studies (BOS) meeting are as follows

UG BOS for AY 2025-26

S.No	Designation	Honorarium (Rs)	TA
1	University Nominee	1000	Below 20 Km @Rs.200/- (Local Conveyance) Above 20 Km, Bus fare/Train fare (Whichever is less)
2	Subject Expert	500	Below 20 Km @Rs.200/- (Local Conveyance) Above 20 Km, Bus fare/Train fare (Whichever is less)
3	Industrialist	500	Below 20 Km @Rs.200/- (Local Conveyance) Above 20 Km, Bus fare/Train fare (Whichever is less)

PG BOS for AY 2025-26

S.No	Designation	Honorarium (Rs)	TA
1	University Nominee	1000	Below 20 Km @Rs.200/- (Local Conveyance) Above 20 Km, Bus fare/Train fare (Whichever is less)
2	Subject Expert	500	Below 20 Km @Rs.200/- (Local Conveyance) Above 20 Km, Bus fare/Train fare (Whichever is less)
3	Industrialist	500	Below 20 Km @Rs.200/- (Local Conveyance) Above 20 Km, Bus fare/Train fare (Whichever is less)

- Binding charges limited to Rs.250/- per program.
- The Bills/Vouchers shall be in compliance with applicable rules and norms.

Following contents shall be presented in the BOS document in the order

1. Proceedings of the Principal pertaining to BOS
2. Composition of BOS
3. Vision and Mission of the department
4. Agenda: It shall include ATR on the previous BOS meeting first, resolutions, etc., later.
5. Table showing the Allocation of Credits in the following table for both theory and Practicals' in case of science subjects

S. No	Semester	Title of the Course (Paper)	Hrs./week	Max. Marks (SEE)	Marks in CIA	Credits
1	III	Physical Chemistry-1	3	50	50	4

6. Resolutions adopted in the meeting with detailed discussion that took place during the meeting.
7. Each BOS Chairman shall, immediately after syllabus, tabulate the changes made in the syllabus/ paper along with justification.
8. Attendance of Members present with signatures in the tabular form.
9. List of Examiners & Paper setters (Minimum 20 members and at least 02 members from other states)
10. Syllabus for each course (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical) and allocation of CIA (50marks) for each course with structure.
11. Each student (2025-26 AB) has to complete one MOOCS course from SWAYAM in any subject per year.

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- Mid examinations are to be conducted in offline mode at college level
- Mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **three short** answer questions with five marks each out of five questions
- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Seminar- 5M	Assignment- 5M	Viva on theory- 3M	Clean & green and Attendance- 2M

TEMPLATE FOR BOS COMPOSITION

PROCEEDINGS OF THE PRINCIPAL(FAC), P.R. GOVERNMENT COLLEGE(A), KAKINADA

Present: Dr. Kandula Anjaneyulu, M.A, Ph.D.

R.C.No.2/A.C/BOS – Members Nomination/2025-26 Dated: 31.07.2025

SUB: P.R. Government College(A), Kakinada- UG/PG Board of Studies (BOS) - Nomination of Members - Orders issued.

REF: Proc.RC.No.1/A.C/BOS/2025-26 dated:31 July 2025 of the Principal, Pithapur Rajah's Government College(A) Kakinada.

ORDER:

The Principal, P.R. Government College(A), Kakinada is pleased to constitute UG/PG Boards of Studies in ----------for framing the syllabi in respective Subject for all Semesters duly following the norms of the UGC Autonomous guidelines.

S. No	Name of the Person	Designation
1		Chairman & Lecturer Incharge, Department.
2		University Nominee
3		Subject Expert -I Lecturer in.
4		Subject Expert - II Lecturer in
5		Representative from Industry
6		Member
7		Member
8		Member
9		Member
10		Member
11		Member
12		Member
13		Member
14		Member
15		Student Alumni Member
16		Student Member
17		Student Member

The above members are requested to attend the BoS meeting on - -2025 and share their valuable reviews, and suggestions on the following functionaries.

- Prepare syllabi for the subject keeping in view the objectives of the college and interest of the stake holders for consideration and approval of the IQAC and Academic Council.
- Suggested methodologies for innovative teaching and evaluation techniques.
- Suggest the panel of Names to the academic council for appointment of Examiners.
- Coordinate research, teaching, extension and other activities in the Department.

PRINCIPAL

P. R. Government College(A), Kakinada

The Chairpersons of all Boards of Studies are hereby instructed to comply with these directives in letter and spirit to ensure the highest standards of academic and administrative excellence.

PRINCIPAL
P.R. Govt. College (Autonomous)
Kakinada

PRINCIPAL
Pithapur Rajah's Government College(A)
KAKINADA-533 001.

Copy to:

1. Lecturers-in-Charge (BOS Chairmen) of all the departments
2. Academic Coordinator
3. IQAC coordinator
4. Controller of Examinations
5. Office

PITHAPUR RAJAH'S GOVERNMNET COLLEGE (A) :: KAKINADA

DEPARTMENT OF CHEMISTRY

MEMBERS ATTENDED FOR BoS MEETING FOR THE AY 2025-26

ANALYTICAL CHEMISTRY

DATE: 07-08-2025

SNO	Name of the Member	DESIGNATION	SIGNATURE
1	Sri V. Sanjeev Kumar	Chairman, BoS Head of the department	V. Sl
2.	Dr. T. Narsimha Murthy Government Arts College, RJY	University Nominee	
3.	Dr. K. Anitha A.S.D College for Women (A)	Subject Expert	7/8/2025
4.	Dr. V. Anantha Lakshmi GDC, Pithapuram	Subject Expert	
5.	P. Karuna Raman Ideal Organics, HYD	Industrialist	Dr.P.Karuna Raman
6.	Sri. T.V.V. Satyanarayana	Member	T.V.V. 7/8/25
7.	Sri. P. Vijaya Kumar	Member	7/8/25
8.	Sri. V. Rambabu	Member	7/8
9.	Smt. G. Pavani	Member	
10.	Dr. N. Bujji Babu	Member	7/8/25
11	Dr. A. Chandra leela	Member	07/8/2025
12.	Dr. Ch. Praveen	Member	07/8/25
13.	Sri. V. Venkateswara Rao	Member	
14.	Sri. U.S.N. Prasad	Member	
15.	Dr. D. S. V. N. Ramamurthy	Member	
16.	M. S. S. V. Uma Gayathri	Member	
17.	D. Bhavya sri	Alumni member	
18.	M. Akshita III B.Sc Analytical Chemistry (H)	Student member	M. Akshitha
19.	S. Sai Kiran II B.Sc Analytical Chemistry (H)	Student member	S. Sai Kiran.

TABLE OF CONTENTS

B. Sc., Analytical Chemistry (Hons)

About the Programme:

The B.Sc. Analytical Chemistry programme is an undergraduate course introduced by the Department of Chemistry to develop in-depth understanding and practical competence in modern analytical techniques. The programme aims to provide students with strong theoretical knowledge, laboratory proficiency, and data interpretation skills essential for chemical analysis in industrial, environmental, and research contexts.

Through a combination of core analytical courses and fundamental chemistry papers, the curriculum ensures a balance between conceptual learning and hands-on experimentation. It emphasises precision, accuracy, and instrumental expertise—preparing students for diverse roles in industry, academia, and applied research.

Academic Rationale

Analytical Chemistry serves as the foundation of chemical sciences, enabling qualitative and quantitative determination of materials across all branches of science. The programme has been designed to keep pace with rapid advancements in instrumentation, automation, and environmental monitoring. It aligns with the National Education Policy (NEP) objectives of interdisciplinary learning, skill development, and outcome-based education.

1. Relevance to Regional and Industrial Needs

- The Kakinada region, being an industrial hub with organisations such as ONGC, GAIL, HPCL, Dr. Reddy's Laboratories, and several food and chemical industries, demands skilled analytical chemists for process control and quality assurance.
- The Kakinada SEZ and nearby industrial and petrochemical corridors further increase the need for trained personnel in analytical testing and environmental compliance laboratories.
- The course provides region-specific skill training, linking academic learning directly to local employment potential.

2. Skill Development and Employability Focus

- The programme emphasises instrumental analysis using UV-Visible, IR, NMR, AAS, TLC, GC, and HPLC methods to build industry-ready competence.
- Students are trained in sample preparation, data interpretation, method validation, and quality control—skills that are highly valued in analytical, pharmaceutical, food, and environmental laboratories.

- The course supports the Skill India and Atmanirbhar Bharat initiatives by promoting applied learning and entrepreneurship in chemical analysis.

3. Career Prospects and Opportunities

Graduates of Analytical Chemistry are well-positioned for employment in

- Quality Control and Quality Assurance (QC/QA) divisions of chemical, pharmaceutical, and petrochemical industries,
- Environmental monitoring and pollution control laboratories,
- Forensic, food testing, and water quality labs,
- Analytical research and development (R&D), as well as technical service roles in instrumentation companies.

The programme also provides a pathway for higher education such as M.Sc. in Analytical Chemistry, Industrial Chemistry, or integrated M.Sc.–Ph.D. programmes.

4. Research and Experiential Learning

- Students undertake mini-projects, seminars, and industrial visits to gain practical exposure and research orientation.
- Emphasis is placed on problem-solving, data analysis, and reporting accuracy—core competencies for research laboratories.
- Opportunities are provided for participation in student research, internships, and collaborative analytical workshops to foster critical and innovative thinking.

5. Community Outreach and Environmental Awareness

- The course encourages students to apply analytical techniques for community-based environmental assessments, including water, soil, and air quality evaluation.
- Green Chemistry and sustainable analytical practices are integrated into the curriculum to promote eco-conscious laboratory work.
- Students engage in extension lectures, study tours, and awareness programmes that link scientific education with societal well-being.

6. Contemporary and Interdisciplinary Dimensions

Analytical Chemistry naturally bridges chemistry, environmental science, biology, and computational data analysis. The programme addresses modern challenges such as pollution monitoring, food adulteration detection, and pharmaceutical residue analysis.

By integrating instrumental training, digital literacy, and sustainability principles, it ensures that graduates remain relevant to current industrial and societal needs.

ADIKAVI NANNAYA UNIVERSITY RAJAMAHENDRAVARAM
OFFICE OF THE DEAN, ACADEMIC AFFAIRS

No.ANUR PR (A)/BoS/2025/38 Dt.17.06.2025

PROCEEDINGS OF THE VICE-CHANCELLOR

Sub: ANUR – University Nominees – UG Board of Studies of Pithapur Rajah's Government College (A) Kakinada – Orders – Issued
Read: -Note orders of the Vice-Chancellor dated 13.06.2025

ORDER: *****

With reference to above, the Vice-Chancellor is pleased to order that the following members be nominated as University Subject Experts for constitution of UG Board of Studies of Pithapur Rajah's Government College (A) Kakinada, for a period of 3 years from the date of orders issued as detailed against each subject.

Sl. No	BOS	Name of the expert nominated
1	English	Prof.S.Prasanthi Sree, M.S.N Campus Kakinada
2	Telugu	Dr.S.Gopalayya, GDC Tadepalligudem
3	Hindi	Dr.N.V.Ramana, GDC Ramachandrapuram
4	Sanskrit	Dr.P.Umamaheswara Rao, Dr.V.S Krishna GDC (A), Visakhapatnam
5	Mathematics	Ms.Y.Padmaja GDC Ramachandrapuram
6	Statistics	Dr.N.Madavi GDC(A) RJY
7	Physics, Electronics & Renewable energy	Dr.M.V.K.Mehar, GDC, K.Perupalem
8	Chemistry, Organic Chemistry, Analytical Chemistry	Dr.T.Narasimha Murthy, GDC (A) RJY
9	Pharmaceutical Chemistry	P.Sai Kiran, Adithya University Kakinada
10	Botany	Dr.K.Usha sri GDC Pithapuram
11	Zoology	Dr.K.Ramaneswari, AKNU, RJY
12	Aquaculture	Dr.D.Kalyani, AKNU, RJY
13	Biotechnology	Dr.B.Nageswari, GDC (A) RJY
14	Microbiology	Dr.D.Aruna, SRR & CVR GDC (A) Vijayawada
15	Artificial Intelligence	N.Naga Subrahmanyeswari, ASD College for Women (A), Kakinada
16	Data Science	Sri.K.Rasmi Ranjan, GDC(A), Tuni
17	Internet of Things	Smt.Dr.K.Sobha Rani, GDC, Ramachandrapuram
18	Computer Applications	Smt.Dr.K.Sobha Rani, GDC, Ramachandrapuram
19	Information Technology	Smt.N.Naga Subrahmanyeswari, ASD College for Women (A), Kakinada
20	Economics	Dr.K.Yamuna, ASD GDC(W), Kakinada
21	History	Ch.Padmavathi, GDC, Pithapuram
22	Political Science & International relations	Dr.K.Swamiji, Ideal DC(A), Kakinada
23	Commerce & Management	Dr.G.Arun Kumar, Dr.VS Krishna GDC(A) Visakhapatnam
24	Philosophy	Dr.Ch.Lalitha, GDC(A) Tuni

(BY ORDER)

Dean,
Academic Affairs 17.6.25

To
The Principal, Pithapur Rajah's Government College (A) Kakinada
The Above Members
The Principals concerned
PS to VC,
PA to R,
OOF

Vision and Mission – Department of Chemistry

Vision:

To empower and equip learners with comprehensive knowledge, advanced skills, and a strong research culture in emerging fields of chemistry, positioning them at the forefront of global scientific advancements. By integrating high-quality pedagogy, ethical values, and cutting-edge technology, we aim to create a transformative teaching-learning environment that enhances employability opportunities and prepares students for success in both academia and industry.

Our vision is to establish the Department of Chemistry as a centre of excellence, fostering a passion for chemistry in professional courses, and becoming a leading institution known for igniting curiosity, nurturing talent, and driving innovation. By creating a dynamic and inclusive academic community, we aim to inspire students to push the boundaries of knowledge and contribute meaningfully to the field of chemistry in both regional and global contexts.

Mission:

1. Innovative Teaching and Learning Practices.
2. Hands-on Experience and Practical Training.
3. Collaboration with Industry and Research Institutions
4. Community and Regional Development.
5. Research Excellence.
6. Holistic Development of Students.
7. Commitment to Sustainable Practices.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A), KAKINADA

DEPARTMENT OF CHEMISTRY

BOS MEETING FOR BSc., ANALYTICAL CHEMISTRY Dt.07-08-2025

The meeting of Board of studies in B.Sc Analytical Chemistry (Hons) is convened on 07-08-2025 12.10PM in offline and Online mode through Virtual Conference by Google Meet. V.Saanjeeva Kumar Chairman BOS, Dr.T.Narasimha Murthy, University Nominee, GDC(A),Rjy. Dr.K.Anitha, ,Lecturer in chemistry, Subject Expert A.S.D.Govt Degree College for Women(A), Kakinada, Dr.V.Anantha Lakshmi, ,Lecturer in chemistry, Subject Expert, Govt Degree College, Pithapuram, Dr.P.Karuna Raman, Industrialist, Ideal Organics, Hyderabad. Ms.D.Bhavya Sri, Alumni, all faculty members of department of Chemistry and student representatives attended the meeting. The Board discussed the following Agenda Points and Resolved the subsequent Resolutions.

AGENDA

1. ATR on previous BoS Resolutions
2. Approval of Syllabus of both Theory and Practical courses for Semesters - III, IV and V
3. Syllabus for I and II semesters will be ratified as and when the APSCHE release. As Organic Chemistry is not a conventional program, If APSCHE doesn't design the syllabus and ask the Department concerned to design its own syllabus then the same will be implemented for the students who got admitted in to B.Sc, Organic chemistry (Hons) for the Academic year 2025-26.
4. Approval of Continuous Internal assessment of each course which comprises of 50 Marks

A) Out of 50 marks, 25 marks were allocated for mid - term examinations (Average of 2 mid-term examinations).

B) Approval of Model Question paper for Mid term examination which comprises of two Long Answer Questions (LAQs) in which student has to attempt one LAQ which carries 10 marks and out of five Short Answer Questions (SAQs), student has to attempt three SAQs with 5 marks each.

C) The remaining 25 marks will be distributed as 10 marks for project, 5 marks for Student Seminar, 5 marks for Assignments, 3 marks for Viva on theory and 2 marks for Clean & Green and Attendance.

5. Approval of List of Question Paper setters and Examiners & (Minimum 20 members with at least 02 members from other states)
6. Approval of Semester End Examination model paper for each course
7. Each student (2025-26 AB) has to complete one MOOCS course from SWAYAM in any subject per year

Department activities Proposed for the academic year 2025-2026.

1. Proposed to Organize 1 National seminars/Workshop/ Conference (Mandatory for each Department)

   i) Awareness on OZONE protection

   ii) National Chemistry Day

   iii) National Science Day 2025

   iv) Guest lectures-2

   v) National seminar in chemistry

   vi) Training in water analysis

Plan for organizing Study / Industrial Tours to the following Organizations

I. Hetero Laboratories, Nakkapally

II. Dr. Reddy's Laboratories, Yanam.

III. National Institute of Hydrology, Kakinada.

IV. Venky Parenterals, Yanam

2. Plan for organizing subject oriented community outreach programs
3. Institution of new medals/incentives/prizes etc., from alumni, philanthropists, parents, faculty etc., - Strategies to be recommended
4. Online MOOCS course-1.
5. Any other program that enhances the learning capacity of students and their employable & knowledge skills.

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Department of Chemistry B. Sc., Analytical Chemistry (Hons) Board of Studies

2025-26 Meeting dt.07-08-2025

RESOLUTIONS TO AGENDA ITEMS

1. **Approval of Syllabus for Semesters-I, II, III, IV, V & VI**

Resolution: The Board unanimously approved the proposed syllabus for Semesters- I, II, III, IV , V & VI of B.Sc. Analytical Chemistry for implementation from the academic year 2025–26.

2. **Continuous Internal Assessment (CIA) for Each Course (50 Marks Structure)**

Resolution: The proposed CIA structure comprising 50 marks per course was approved.

- Term exams (average of two midterms): 25 marks
- Project: 10 marks
- Seminar: 5 marks
- Assignments (5): 5 marks
- Viva (theory): 3 marks
- Clean & Green + Attendance: 2 marks

3. **Approval of List of Examiners and Paper Setters (Minimum 20 Members, Including at Least 2 from Other States)**

Resolution: The Board approved the submitted list of examiners and paper setters with the recommendation to include a minimum of two members from institutions outside the state for greater academic diversity and quality.

4. **Approval of Syllabus Structure, Model Question Papers (Theory & Practical) for Each Course**

Resolution: The Board reviewed and approved the syllabus for each course along with practical components, model question papers (theory & practical) for effective assessment and transparency.

5. **Mandatory Completion of One MOOC Course Per Year (SWAYAM) for 2025-26 Admitted Batch**

Resolution: The BoS approved the requirement for students to complete one online MOOC course (from SWAYAM or other UGC-approved platforms) per academic year to improve self-learning, digital literacy, and employability.

APPROVALS FOR PROPOSED DEPARTMENTAL ACTIVITIES (2025–26)

1. **Organizing National Seminars/Workshops/Conferences and Guest Lectures**

Resolution: The following academic events were approved to promote awareness and exposure:

- National Seminar/Workshop on Ozone Awareness
- Celebrations for National Chemistry Day and National Science Day
- Guest Lectures – Minimum 2 (Experts from Industry/Academia)
- National-level Seminar in Chemistry
- Skill-based Training Program in Water Analysis

2. **Industrial/Study Tours**

Resolution: The Board approved organizing industrial visits/study tours to:

- Hetero Laboratories, Nakkapally
- Dr. Reddy's Laboratories, Yanam
- National Institute of Hydrology, Kakinada
- Venky Parenterals, Yanam

3. **Community Outreach Programs**

Resolution: The proposal for organizing subject-oriented community outreach programs (such as health camps, awareness drives, rural education workshops) was accepted to strengthen social responsibility and student engagement.

4. **Institution of New Medals/Incentives/Prizes from Alumni, Philanthropists, Parents, and Faculty**

Resolution: The Board supported the initiative and recommended forming a committee to approach and mobilize potential sponsors for instituting awards and incentives for meritorious students.

5. **MOOC Course – Online (SWAYAM) – One Course per Student**

Resolution: Reinforced and approved as a compulsory academic requirement for all students from the 2025–26 batch onwards.

6. **Other Learning Enhancement Programs**

Resolution: The Board encouraged the implementation of additional skill-development programs, certificate courses, industrial training, soft skills workshops, and collaborative activities with placement cells to enhance employability and knowledge levels.

The Board appreciated the proactive initiatives of the Department of Chemistry in curriculum design, student engagement, and academic excellence. All agenda items were discussed and resolved positively.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
KAKINADA 533 001-ANDHRA PRADESH
An AUTONOMOUS and NAAC Accredited Institution (B++ Grade- 2.82 CGPA)
(Affiliated to ADI KAVI NANNAYA UNIVERSITY, Rajamahendravarm.)

ACADEMIC CELL

(Certificate to be issued by the University Nomine/Subject Expert/Member of BOS)

Department Name: Analytical Chemistry

Name of the BOS Member : Dr. T. Narasimha Murthy

(University Nominee /Subject Expert/Industrialist / Member)

I certify that the syllabus submitted by the ..Analytical Chemistry.. Department is verified by me and I recommend the following suggestions:

1. Introduce value added courses like cheminformatics in collaboration with reputed Institutes
2. Introduce mini-projects rather than curriculum.
3.
4.
5.

The syllabus is approved with the above suggested modification

Signature with Date

Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
KAKINADA 533 001-ANDHRA PRADESH
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ACADEMIC CELL

(Certificate to be issued by the University Nomine/Subject Expert/Member of BOS)

Department Name: Analytical Chemistry

Name of the BOS Member : Dr. K. Anitha

(University Nominee /Subject Expert/Industrialist / Member)

I certify that the syllabus submitted by the ..... Department is verified by me and I recommend the following suggestions:

1. Emphasize hands-on training with the
2. modern analytical techniques like HPLC, G.C
3. It is suggested that university modified syllabus
4. incorporated even though syllabus prescribed by APSCHE
5.

The syllabus is approved with the above suggested modification

Signature with Date 7/08/2025

Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
KAKINADA 533 001-ANDHRA PRADESH
An AUTONOMOUS and NAAC Accredited Institution (B++ Grade- 2.82 CGPA)
(Affiliated to ADI KAVI NANNAYA UNIVERSITY, Rajamahendravarm.)

ACADEMIC CELL

(Certificate to be issued by the University Nomine/Subject Expert/Member of BOS)

Department Name: Analytical Chemistry

Name of the BOS Member : Dr. V. Anantha Lakshmi

(University Nominee /Subject Expert/Industrialist / Member)

I certify that the syllabus submitted by the .....Analytical Chemistry Department is verified by me and I recommend the following suggestions:

1. Engage green lab practicals
2. Calibrate each instrument before performing
3. Introduce latest analytical experiments, methods in analytical chemistry
4.
5.

The syllabus is approved with the above suggested modification

Signature with Date

Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus

PITHAPUR RAJAH'S GOVERNMNET COLLEGE (A) :: KAKINADA

DEPARTMENT OF CHEMISTRY

ANALYTICAL CHEMISTRY BOARD OF STUDIES 2025-26

ADDITIONS AND DELETIONS

DATE: 07-08-2025

1. III semester, course - VII theory syllabus including practical is 100% changed.

2. IVth semester, course - IX theory syllabus including practical is 100% changed.

V.P. Chairman BoS | University Nominee | Subject Expert 7/08/2025 | Subject Expert

Members

T.V.V. 7/8/25

7/8/25

08/08/2025

07/8/2025

7/8

7/8/25

7/8

V. Venkateswarlu 07/8/25

CURRICULAR FRAMEWORK B.Sc ANALYTICAL CHEMISTRY HONOURS FROM THE A.Y. 2025-26 (Major + Minor with CSP)

I Year – I Semester

S. No	Category	Course No	No. of Hours		Total No. of Hours	No. of Credits		Total No. of Credits
			Theory	Practical		Theory	Practical	
1	Major – Core	I	3	2	5	3	1	4
2	Major – Core	II	3	2	5	3	1	4
3	AECC- English	I	4	0	4	3	0	3
4	AECC- MIL(Tel/Hin/San)	I	4	0	4	3	0	3
5	Skill Enhancement Course-Introduction to Artificial Intelligence	I	4	2	6	4	0	4
End of Semester I of I Year		**5**	**18**	**6**	**24**	**16**	**2**	**18**

I Year – Semester II								
S.No	Category	Course No	No. of Hours		Total No. of Hours	No. of Credits		Total No. of Credits
			Theory	Practical		Theory	Practical	
1	Major – Core	III	3	2	5	3	1	4
2	Major – Core	IV	3	2	5	3	1	4
3	AECC- English	II	4	0	4	3	0	3
4	AECC- MIL(Tel/Hin/San)	II	4	0	4	3	0	3
5	Skill Enhancement Course- Application of Artificial Intelligence	II	4	2	6	4	0	4
6	Multidisciplinary Course	I	2	0	2	2	0	2
7	Indian Knowledge System	I	2	0	2	2	0	2
8	Community Service Project (Minimum of 80 hours)							1
End of Semester II of I Year		7	22	6	28	20	2	23

CURRICULAR FRAMEWORK B.Sc HONOURS FROM THE A.Y. 2025-26
(Major + Minor with CSP & VI Semester Internship)

2nd Year - Semester III

Sl. No	Category	Course No	No. of Hours		Total No.of Hours	No. of Credits		Total No. of Credits
			Theory	Practical		Theory	Practical	
1	Major –Quantitative methods of analysis	V	3	2	5	3	1	4
2	Major – Separation methods	VI	3	2	5	3	1	4
3	Major – Physical chemistry-I	VII	3	2	5	3	1	4
4	Major- General inorganic chemistry	VIII	3	2	5	3	1	4
5	Minor	II	3	2	5	3	1	4
6	Multidisciplinary Course	III	2	0	2	2	0	2
7	Skill Enhancement Course (SEC) Design Thinking/Problem Solving / Others	IV	2	0	2	2	0	2
End of Semester III of 2nd Year		**7**	**19**	**10**	**29**	**19**	**5**	**24**

2nd Year - Semester IV								
Sl. No	Category	Course No	No. of Hours		Total No. of Hours	No. of Credits		Total No. of Credits
			Theory	Practical		Theory	Practical	
1	Major – Physical chemistry-II	IX	3	2	5	3	1	4
2	Major – Spectroscopy	X	3	2	5	3	1	4
3	Major – Separation methods-II	XI	3	2	5	3	1	4
4	Minor	III	3	2	5	3	1	4
5	Minor	IV	3	2	5	3	1	4
6	Multidisciplinary Course	IV	2	0	2	2	0	2
7	Skill Enhancement Course (SEC) Design Thinking/Problem Solving / Others	VI	2	0	2	2	0	2
End of Semester IV of 2nd Year		7	19	10	29	19	5	24

3rd Year - Semester V								
Sl. No	**Category**	**Course No**	**No. of Hours**		**Total No. of Hours**	**No. of Credits**		**Total No. of Credits**
			Theory	**Practical**		**Theory**	**Practical**	
1	Major- Environmental Chemistry	XII	3	2	5	3	1	4
2	Major – Chromatography & Instrumental methods of Analysis	XIII	3	2	5	3	1	4
3	Major – GreenChemistry & Nanotechnology	XIV	3	2	5	3	1	4
4	Major- Analysis of Organic Compounds	XV	3	2	5	3	1	4
5	Minor	V	3	2	5	3	1	4
6	Minor	VI	3	2	5	3	1	4
End of Semester V of 3nd Year		**6**	**18**	**12**	**30**	**18**	**6**	**24**

3rd Year Semester-VI

1	Apprenticeship							12

CIA structure for Single Major system (w.e.f 2024-25AB)

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations will be conducted and the average of the two is considered.

- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.

- I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions with one mark each for each paper.

- Question paper is to be given as per the following structure for the courses with **4 units.**

Unit No	Long Answer Question(10M)	Short Answer Question (5 M)	Objective Questions(1M)
I	1	2/1/3	3/2
II	1	2/3/1	2/3
III	1	1	1
IV	1	1	1
V	0	2	3
Note: The mid examinations if conduct in offline mode the above pattern is applicable. If anyone exam if conduct online then all the questions are given in the form of multiple choice, fill in the blanks, matching.			

B.Sc., ANALYTICAL CHEMISTRY
NEW COURSES INTRODUCED wef: 2025-26

ACADEMIC YEAR	SEMESTER	PROGRAMME	COURSE NO	NAME OF THE COURSE INTRODUCED
2025-26	I	B.Sc., ANALYTICAL CHEMISTRY	AC-1	INORGANIC CHEMISTRY-1
2025-26	I	B.Sc., ANALYTICAL CHEMISTRY	AC-2	BASICS OF CHEMICAL ANALYSIS
2025-26	II	B.Sc., ANALYTICAL CHEMISTRY	AC-3	ORGANIC CHEMISTRY-I
2025-26	II	B.Sc., ANALYTICAL CHEMISTRY	AC-4	QUANTITATIVE METHODS OF ANALYSIS
2025-26	V	B.Sc., ANALYTICAL CHEMISTRY	AC-12	ENVIRONMENTAL CHEMISTRY
2025-26	V	B.Sc., ANALYTICAL CHEMISTRY	AC-13	CHROMATOGRAPHY AND ANALYTICAL TECHNIQUES
2025-26	V	B.Sc., ANALYTICAL CHEMISTRY	AC-14	INSTRUMENTAL METHODS OF ANALYSIS
2025-26	1V	B.Sc., ANALYTICAL CHEMISTRY	AC-15	PHYSICAL CHEMISTRY-III

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A),KAKINADA			
DEPARTMENT OF CHEMISTRY			
ANALYTICAL CHEMISTRY:: 2025-26			
LIST OF PAPER SETTERS AND EVALUATORS			
S.NO	**Name of the Question paper setter by Valuation**	**Designation**	**Name of the College**
1	P.Sivakumar	Lecturer in Chemistry	GDC(A),Rajamundry
2	Dr.T.Narasimhamurty	Lecturer in Chemistry	GDC(A),Rajamundry
3	Dr.P.Mallikarjuna	Lecturer in Chemistry	GDC(A),Rajamundry
4	B.Venkatarao	Lecturer in Chemistry	GDC(A),Rajamundry
5	Dr.N.Baby Nirmala	Lecturer in Chemistry	GDC(A),Rajamundry
6	Dr.M.Sunitha	Lecturer in Chemistry	SKRW-Rajamundry
7	S.Dilleswararao	Lecturer in Chemistry	GDC-TUNI
8	D.Pallam Raju	Lecturer in Chemistry	GDC-Mummidivaram
9	Dr.V.Ananthalakshmi	Lecturer in Chemistry	GDC-Pithapuram
10	K.Anand	Lecturer in Chemistry	GDC-Pithapuram
11	Dr.V.Narayana Rao	Lecturer in Chemistry	GDC-Perumalpuram
12	V.Mallikarjuna Sarma	Lecturer in Chemistry	GDC-Jaggampeta
13	N.V.N.B.Srinivasarao	Lecturer in Chemistry	GDC-Kaikaluru
14	Dr.N.Padmavathi	Lecturer in Chemistry	GDC-Kandukuru
15	Dr.V.Shantikumar	Lecturer in Chemistry	SRMBJNR College-Khammam
16	Dr.Sai Krishna	Lecturer in Chemistry	V.S.Krishna College(A),Visakhapatnam
17	Dr.S.Ramakrishna	Lecturer in Chemistry	GDC(M),Srikakulam
18	U.Sai Krishna	Lecturer in Chemistry	GDC(A),Rajamundry
19	Dr.A.Srinivasarao	Lecturer in Chemistry	GDC-TUNI
20	J.Suresh	Lecturer in Chemistry	GDC(A),Rajamundry
21	Dr.P.Srinivasarao	Lecturer in Chemistry	GDC-Addanki
22	Dr.V.V.Ravindra	Lecturer in Chemistry	GDC-Repalle

	PITHAPUR RAJAH'S GOVERNMENT COLEGE(A) Kakinada DEPARTMENT OF CHEMISTRY	Program & Semester I B.Sc. Analytical Chemistry (I Semester)			
Course Code ANA CHE-1	TITLE OF THE COURSE **INORGANIC CHEMISTRY-1**				
Teaching	Hours Allocated:45 (**Theory**)	L	T	P	C
Pre-requisites	Atomic models and chemical bonding	45	10	30	3+1

Course Objectives:

1. Atomic Structure and Periodic table
2. Chemical Bonding and Molecular Structure
3. Acids, Bases & HSAB Principle
4. Chemistry of p-block elements
5. Chemistry of d-block & f-block elements

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Explain the fundamental concepts of atomic structure and periodic properties based on quantum mechanical principles, and relate these to the behavior and reactivity of elements in the periodic table.
CO2	Understand the nature and types of chemical bonds, interpret molecular geometry using VSEPR and hybridization concepts, and apply Valence Bond and Molecular Orbital theories to explain bonding in molecules.
CO3	Gain knowledge of various acid-base theories, solvent types, redox reactions, and salt hydrolysis, and apply the HSAB principle to predict chemical reactivity and stability of compounds.
CO4	Describe the structural features, bonding nature, and reactivity of selected p-block compounds and distinguish between different types of oxides, interhalogens, and pseudohalogens.
CO5	Understand the electronic structure, oxidation states, and characteristic properties of d- and f-block elements

Course with focus on Skill Development/Employability/Entrepreneurship modules

Skill Developement		Employability		Entrepreneurship	

Syllabus:

UNIT-I: Atomic Structure and Periodic table **9 h**

Electronic configuration, Quantum Numbers, Bohr theory, De Broglie Equation, Heisenberg Uncertainty Principle, Schrodinger Equation, Significance of Wave functions, Pauli's exclusion principle, Hund's rule, Aufbau principle, Octet Rule.
Periodicity: Classification of elements in Periodic Table, General properties of atoms: atomic radii, Ionic radii, ionization energy, electron affinity; electronegativity- Pauling, Mulliken-Jaffe Rule, isoelectronic relationship; inert-pair effect.

UNIT-II : Chemical Bonding and Molecular Structure **9 h**

Classification of Chemical bonds, Valence electrons, Lewis structure, Polar character of covalent bond, Covalent character of ionic bond- polarization, Fajan's rules.

Valence Bond Theory, Geometry of covalent molecules (BF_3, CH_4, PCl_5), Concept of hybridization, VSEPR theory (NH_3, H_2O, SF_4), Molecular orbital theory, bonding and nonbonding electrons (N_2, O_2, CO and NO), Hydrogen Bond, Intra- and intermolecular hydrogen bonding.

UNIT-III: Acids, Bases & HSAB Principle **9 h**

Theories of acids and bases: Arrhenius theory, Bronsted-Lowry theory, Lewis theory, Nonaqueous solvents: classification-protonic and aprotic solvents, Types of chemical reactions: acid-base, oxidation-reduction, calculation of oxidation number. Types of salts, Salt hydrolysis. Pearson's concept, HSAB principle & its Applications.

Unit-IV: Chemistry of p-block elements **9 h**

Group 13: Structure and Properties of Diborane, Borazine.
Group 15: Structure and Properties of Phosphonitrilic Chloride ($P_3N_3Cl_6$)
Group 16: Classification of Oxides based on chemical behavior & Oxygen Content
Group 17: Structure and Properties of Interhalogen compounds, Pseudohalogens

Unit-5: Chemistry of d-block & f-block elements **9 h**

Chemistry of d-block elements: electronic configuration, variable valency, colour, magnetic properties, catalytic properties and ability to form complexes.
Chemistry of lanthanides: electronic configuration, oxidation states, lanthanide contraction, consequences of lanthanide contraction, colour, magnetic properties. Separation of lathanides by ion exchange method.

Reference books

S.NO	AUTHOR	TITLE	PUBLISHER
1	J. D. Lee	Concise Inorganic Chemistry	Blackwell Science
2	B. R. Puri, L. R. Sharma, K. C. Kalia,	Principles of Inorganic Chemistry	Shoban Lal Nagin Chand and Co
3	D. F. Shriver and P. W. Atkins,	Inorganic Chemistry	W. H. Freeman and Co

Course outcome & Program outcome mapping

On Completion of the course, the students will be able to	
CO1	Explain the fundamental concepts of atomic structure and periodic properties based on quantum mechanical principles, and relate these to the behavior and reactivity of elements in the periodic table.
CO2	Understand the nature and types of chemical bonds, interpret molecular geometry using VSEPR and hybridization concepts, and apply Valence Bond and Molecular Orbital theories to explain bonding in molecules.
CO3	Gain knowledge of various acid-base theories, solvent types, redox reactions, and salt hydrolysis, and apply the HSAB principle to predict chemical reactivity and stability of compounds.
CO4	Describe the structural features, bonding nature, and reactivity of selected p-block compounds and distinguish between different types of oxides, interhalogens, and pseudohalogens.
CO5	Understand the electronic structure, oxidation states, and characteristic properties of d- and f-block elements

CO-PO Mapping: **1: Low =1 ; 2: Moderate = 2 ; 3: High = 3 ; 4: No Correlation = 0**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1	2	2	1	1	1	3	1	1
CO2	3	2	1	1	1	1	1	2	1	1
CO3	3	3	2	2	1	1	1	3	2	1
CO4	3	2	2	1	2	2	1	3	2	1
CO5	3	1	2	1	1	1	2	2	2	2

PROGRAMME OUTCOMES

At the completion of the B.Sc. Chemistry program, the students of our Department will be able to:

(PO1) Knowledge: Attain in depth knowledge about the fundamental principles, essential facts, conclusions and applications of chemical and scientific theories in various domains of chemistry.

(PO2) Critical Thinking: Carry out experiments in the area of organic analysis, estimation, derivative process, inorganic semi micro analysis, preparation, Kinetic, conductometric and potentiometric experiments and spectral analysis applying the domain of critical thinking.

(PO3) Problem Solving: Define the background of reaction mechanisms, complex chemical structures, instrumental method of chemical analysis, and separation techniques and apply appropriate techniques for analyzing specific problems both qualitatively and quantitatively in laboratories and in industries

(PO4): Usage of modern tools: Create data using modem chemical tools and ICT for modeling and analyze the data obtained from sophisticated instruments (like UV-Vis, FTIR, NMR, GCMS, Fluorescence, SEM, TEM and XRD) for chemical analysis

(PO5): Communication: Develop Skills to evaluate, analyze and interpret the chemical information and data and to communicate effectively within the chemical community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

(PO6): Life-long Learning: Demonstrate scholarly attitude to pursue a career in the field of chemical education and research and have the zeal and vision to engage in independent and life- long learning in the broadest context of technological and social change.

(PO7) Ethical Practices and Social Responsibility: Generate ideas and solutions for green and sustainable chemistry and approach towards planning and execution of research in frontier areas of chemical sciences.

PROGRAM SPECIFIC OUTCOMES (PSO's)

At the time of graduation, our under graduates would be able to:

PSO 1- Evaluate, analyze, interpret and effectively apply the basic laws, principles, phenomena, processes and mechanisms involved in the domain of organic, inorganic, physical and analytical Chemistry

PSO2 - Demonstrate the knowledge of Chemistry in the domain of research, education and perspective entrepreneurship.

PSO3 - Evaluate distinct problems in the field of chemical data analysis, scientific interpretation and reaction mechanisms with an understanding on basic tools to be employe

Weightage to content

Semester -I

Course - 1

S.No	Course Content	Long Answer	Short Answer	Total Marks	As per Blooms Taxonomy
1	Atomic Structure and Periodic table	2	1	25	Understanding, Application
2	Chemical Bonding and Molecular Structure	1	2	15	Remembering, Understanding
3	Acids, Bases & HSAB Principle	1	1	15	Analyzing & Creation
4	Chemistry of p-block elements	1	1	15	Understanding, Application
5	Chemistry of d-block & f-block elements	1	2	20	Understanding, Application
	TOTAL	**6**	**7**	**95**	

P.R. GOVERNMENT COLLEGE (A), KAKINADA

I YEAR B.Sc Analytical Chemistry (Examination at the end of I semester)

(COURSE – 3 – Inorganic Chemistry -1)

MODEL PAPER

Duration: 2hr **Max.Marks:50M**

Section -I

Answer any three of the following questions. Must attempt at least one question from each part.

Each question carries 10 Marks. **3 X 10 = 30M**

Part – A

1. What are postulates of Bohr's theory and explain limitations of his theory
2. Construct MO diagrams for N_2 and CO
3. Explain the Pearson's concept of HSAB principle & its importance

Part - B

4. What are oxides explain their classification based on oxygen content and chemical nature?
5. Explain the characteristics of d- block elements with reference to following.
   a) Electronic configuration b) Variable oxidation states
6. Define Ionization Potential and Electronegativity and Explain trend across the periods and down the group?

Section II

Answer any four of the following questions. Each question carries 5 marks. **4 X 5 = 20M**

7. Explain Hund's rule and Aufbau principle.
8. Define Polarization and write the Fagan rules
9. Explain the structure and hybridization of PCl_5 using Valence bond theory
10. Explain the concept of PH in Acids and Bases
11. Write a note on pseudo halogens
12. What is lanthanide contraction? write its consequences.
13. Explain the complex formation of transition elements with an example?

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SEMESTER-I
COURSE 1: INORGANIC CHEMISTRY-1

Practical Credits: 1 2 hrs/week

Practical- I Qualitative Analysis of simple salt

Course outcomes:

At the end of the course, the student will be able to;

1. Understand the basic concepts of qualitative analysis of inorganic simple salt.
2. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
3. Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis

Laboratory course syllabus: Analysis of simple salt 50 M

Analysis of simple salt containing ONE anion and ONE cation from the following:

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate.

Cations: Lead, Copper, Iron, Aluminum, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Magnesium and Ammonium.

Co-curricular activities and Assessment Methods

1. Continuous Evaluation: Monitoring the progress of student's learning.
2. Class Tests, Work sheets and Quizzes
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4. Semester -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the semester

SCHEME OF VALUATION

a. Preliminary Tests	05 M
b. Identification of anion	08 M
c. Conformation tests for anion	10 M
d. Identification cation (Group separation table)	10 M
e. Conformation of Cation	05 M
f. Report	02 M
g. Viva voce	05 M
h. Record	05 M
TOTAL	**50 M**

QUESTION BANK

UNIT-1

LONG ANSWER QUESTIONS

1. What are postulates of Bohr's theory and explain limitations of his theory
2. Define Ionization Potential and Electronegativity and Explain trend across the periods and down the group ?

SHORT ANSWER QUESTIONS

1. Explain Heisenberg uncertainty principle
2. Explain Diagonal relationship in periodic table
3. Explain Hund's and Aufbau principles
4. Explain measurement of Electronegativity by any two scales

UNIT-2

LONG ANSWER QUESTIONS

1. Explain the geometry of BCl_3 and PCl_5 by valence bond theory.
2. Explain the MO diagrams of N_2 and CO molecules and write its magnetic behaviour.

SHORT ANSWER QUESTIONS

1. Define Polarization and write the Fajan' rules
2. Write about VSEPR theory.

UNIT-3

LONG ANSWER QUESTIONS

1. Explain the Pearson's concept of HSAB principle & its importance
2. Explain Bronsted-Lowry and Lewis theory of Acids and Bases

SHORT ANSWER QUESTIONS

1. Brief the process of Salt hydrolysis
2. Explain the concept of PH in Acids and Bases
3. Explain the relationship between the strength of acids/bases and their pKa and pKb values.
4. What are oxidation and Reduction reactions

UNIT-4

LONG ANSWER QUESTIONS

1. Explain the synthesis and structure of diborane?
2. What are silicones write their classification & applications?
3. What are oxides explain their classification based on oxygen content and chemical nature?
4. Discuss the classification and structure of interhalogen compounds?

SHORT ANSWER QUESTIONS

1. What is inorganic benzene explain its structure?
2. Write a short notes on pseudohalogens.
3. Write the preparation and structure of $P_3N_3Cl_6$.

UNIT-5

LONG ANSWER QUESTIONS

1. Explain the characteristics of d- block elements with reference to following.

a) Electronic configuration

b) Variable oxidation states

2. Write a short note on the following properties of d- block elements.

a) Magnetic properties

b) catalytic properties

3. How to separate the lanthanides by using ion exchange method?
4. Compare lanthanides and actinides?

SHORT ANSWER QUESTIONS

1. Explain the electronic configuration of lanthanide elements.
2. What is lanthanide contraction? write its consequences.
3. Explain the complex formation of transition elements with an example?
4. Discuss the stability of various oxidation states of 3d-series elements.
5. Write a short note on Latimer diagrams.

	P R Govt College(A) Kakinada	Program & Semester I B.Sc. ANALYTICAL CHEMISTRY (Semester-I)			
Course Code -AC 2	TITLE OF THE COURSE **Major -2 BASICS OF CHEMICAL ANALYSIS**				
Teaching	HoursAllocated:45 (**Theory**)	L	T	P	C
Pre-requisites	Basic Concepts in Chemical Analysis, Importance of Analytical Chemistry	45	10	30	4+2

CourseObjectives:

1. Basic Concepts in Chemical Analysis-I
2. Laboratory Apparatus and Calibration
3. Importance of Analytical Chemistry
4. Basic Concepts in Chemical Analysis-II
5. Errors in chemical analysis

Learning Objectives:

1. Understand the Basic Concepts in Chemical Analysis-I.
2. Engage in Laboratory Apparatus and Calibration
3. Demonstrate skills using the alternative techniques in chemical analysis.
4. Demonstrate and explain Importance of Analytical Chemistry
5. Importance of errors in Chemical analysis.

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CourseOutcomes:

On Completion of the course, the students will be able to	
CO1	Student will acquire knowledge on basic concepts in different types of chemical analysis
CO2	Student will get the knowledge in understanding the basic concepts In chemical analysis
CO3	Student shall have opportunity to understand the importance of chemical analysis in recent research trends.
CO4	Students shall Comprehend the applications of different novel reagents and reactions in chemical analysis.

Course with focus on Skill Development/Employability/Entrepreneurship modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT – I: Basic Concepts in Chemical Analysis-I **9hrs**

SI Units: Definitions of the Seven Base Units (Mass, Length, Time, Temperature, Amount of Substance, Electrical current and Luminous intensity), Derived units, Conversion between units.

Chemical Concentrations: Mole, molecular weight, formula weight, and equivalent weight.
Concentration units: Molarity, Normality, Molality, Mole fraction, Percent by weight, Percent by volume, Parts per thousand, Parts per million, Parts per billion, milli moles, Dilution, Dilution Formula. Importance of pH, pOH & pKa in chemical analysis.

UNIT II: Laboratory Apparatus and Calibration **9hrs**

Analytical & Electrical Balance: Theory, Operation, Errors in weighing, Precautions
Common Laboratory Apparatus & Uses: Volumetric flasks, burettes, pipettes, meniscus readers, weighing bottles, funnels, desiccators, drying ovens, filter crucibles
Calibration of Equipment: Definitions, calibration standards, calibration frequency, calibration of pH meter, electronic balance
Laboratory Safety Precautions & First Aid Treatment, Laboratory Notebook Maintenance

Unit -III: Importance of Analytical Chemistry **9hrs**
Introduction to Analytical Chemistry, Role of Analytical Chemistry in Sciences. Methods in Chemical analysis: Qualitative Analysis, Quantitative Analysis; Major, Minor and Trace constituents. Quantitative Methods of Analysis: Classification of analytical methods . Types of analysis – Complete analysis, Partial analysis and Assay of ingredients, the Analytical Chemist and Analyst.

UNIT – IV: Basic Concepts in Chemical Analysis-II **9hrs**
General Steps in Chemical Analysis: Sampling Techniques, Sample Preparation, Sample Treatments: Sample Digestion and Extraction Methods, Sample Detection Methods: Physical, Chemical and Electromagnetic radiations and Electric charge. Selection of Suitable method for Analysis.
Preparing solutions: Standard solutions, Primary standards, Secondary standards, Buffers, Sample Preservation and Storage.

UNIT – V: Errors in chemical analysis **9hrs**
Error Definition, Types of Errors, Accuracy and Precision, Methods to reduce errors in measurement, Mean, Median, Standard Deviation, Relative Standard Deviation, Variance, Range, Probability, Gaussian Distribution Curve, Confidence intervals. Significant figures and Applications

List of Reference books:

1. "Principles of Analytical Chemistry: A Textbook" by Miguel Valcarcel
2. "Analytical Chemistry: Principles" by Kennedy J H
3. Practical Manual for Agricultural Chemistry" by Gupta A K and Varshney M

CO-PO Mapping:

1: Low =1 ; 2: Moderate = 2 ; 3: High = 3 ; 4: No Correlation = 0

	PO1	PO 2	PO3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	PO1 0	PSO1	PSO2	PSO 3
CO1	3	2	3	1	3	2	3	2	2	2	3	3	2
CO2	3	3	2	3	2	2	1	2	2	2	3	3	2
CO3	3	3	3	3	3	2	2	2	2	2	3	3	2
CO4	3	3	3	3	3	2	2	2	2	2	3	2	3
Avg.	3	2.8	2.8	2.5	2.8	2	2	2	2	2	3	2.8	2.3

PO1 : Knowledge in Chemistry : Apply the knowledge of analytical chemistry to the solution of simple to complex of analytical molecules.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze simple to complex problems reaching substantiated conclusions using fundamental principles of green synthesis

.

PO3: Design/development of solutions: Design solutions for simple to complex problems and designing novel routes for the synthesis of bioactive / active pharmaceutical ingredients.

PO4: Conduct investigations of complex problems: Use fundamental research-based knowledge and available research methods including design of experiments, analysis and interpretation of data, and

synthesis of the organic molecules

PO5 : Modern tool usage: Create, select, and apply appropriate techniques, resources, and IT tools for modeling and interpretation of simple to complex organic molecules.

PO6 : Society: Applying the contextual knowledge to assess societal, health, safety, legal and cultural issues.

PO7: Environment and sustainability: Understand the importance of synthetic organic chemistry for various solutions in societal and environmental context and demonstrate the knowledge and need for sustainable development.

PO8 : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the science-based practice.

PO9 : Communication: Communicate effectively on issues related to synthetic organic chemistry with the chemistry community, being able to write the effective reports and documentation, presentations.

PO10: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PSO-1: To have a firm foundation in the fundamentals/concepts/theories and its applications in synthetic organic chemistry.

PSO-2: To understand the structure and properties of reagents, Characteristics mechanisms of chemical reactions and their green synthetic utility.

PSO-3: To acquaint with safety measures in laboratory and develop skills in proper handling of chemicals and apparatus/instruments and carry out experiments, record the observations and present the inference/results

Weightage to content
Semester -1
I B.Sc , Analytical Chemistry
Course code AC-2

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Basic Concepts in Chemical Analysis-I	1	2	20	Understanding , Application
2	Laboratory Apparatus and Calibration	1	1	15	Remembering, Understanding
3	Importance of Analytical Chemistry	2	1	25	Analyzing & Creation
4	Basic Concepts in Chemical Analysis-II	1	1	15	Evaluation, Understanding
5	Errors in chemical analysis	1	2	20	Application & Creation
	TOTAL	**6**	**7**	**95**	

P.R. GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc. Analytical Chemistry
(Examination at the end of I semester)
(COURSE CODE– AC2, BASICS OF CHEMICAL ANALYSIS)

MODEL PAPER

Duration: 2hr **Max. Marks: 50M**

SECTION-I

Answer any **three** of the following questions. Must attempt at least **one** question from each part. Each question carries 10 Marks. 3 X 10M = 30M

Part -A

1. UNIT- 1
2. UNIT -2
3. UNIT- 3

Part -B

4. UNIT-4
5. UNIT-5
6. UNIT- 3

SECTION-II

Answer any **four** of the following questions. Each carry 5 marks. 4 X 5M= 20M

7. UNIT-1
8. UNIT-1
9. UNIT-2
10. UNIT-3
11. UNIT-4
12. UNIT-5
13. UNIT-5

:

LABORATORY COURSE -II **30 hrs (2 h / w)**

Practical-II: Basic Laboratory Practicals (At the end of Semester-I)

1. Calibration of volumetric equipment (volumetric flask, pipette).
2. Preparation of standard solutions of acids and bases of different Concentration units.
3. Calculation of concentration of commercial acids and prepare dilute solutions of different concentrations
4. Preparation and determination of pH of Acidic buffer & Basic Buffer
   Titration of acid-base using pH meter.
5. Calculation of Mean, Median, Standard Deviation, Relative Standard Deviation, Variance, Range of given analytical data.

Scheme of valuation

1.procedure	10M
2.preparation of Standard solution	10M
3.tabular values	10M
4.caluclation	10M
5.record	5M
6. Vava	5M

	50

List of Reference books:

1. Practical Manual for Agricultural Chemistry" by Gupta A K and Varshney M
2. Practical book of analytical chemistry by M.S. Pooja and R .Popat
3. Web related references suggested by teacher