Koneru Lakshmaiah Education Foundation
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XXVIII Academic Council - Annexure 2.4

01-10-2019

DEPARTMENT OF CHEMISTRY
MINUTES OF 3rd BOARD OF STUDIES MEETING

The department of chemistry conducted 3rd BOS meeting on 01-10-2019 in F 008 from 10:00 AM to 1:00 PM.

The following members were present:

1. Dr J V Shanmukha Kumar, Professor, HOD- Chairperson
2. Dr K R S Prasad, Professor, Internal Member
3. Dr Y Anjaneyulu, Professor, Internal Member
4. Dr K Ravindranath, Professor, Internal Member
5. Dr N S Kameswara Rao, Professor, Internal Member
6. Dr M Sujatha, Associate Professor, Internal Member
7. Dr I V Kasiviswanath, Associate Professor, Internal Member
8. Dr T Bhaskara Rao, Assistant Professor, Internal Member
9. Dr Pradeep Kumar Brahman, Assistant Professor, Internal Member
10. Dr A Venkateswara Rao, Assistant Professor, Internal Member
11. Dr S Naresh Varma, Assistant Professor, Internal Member
12. Dr N S M P Latha devi, Associate Professor- Physics, Special invitee
13. Dr B V Appa Rao, Professor- Mathematics, Special invitee
14. Dr M V Basaveswara Rao, Professor- Krishna University, External Member
15. Dr A Ramachandraiah, Professor- NIT Warangal, External Member
16. Dr K Nageswara Rao, Manager, M/S Trimax Biosciences, Raichur, Karnataka, Special invitee
17. Dr Rajkumar Gangula, Principal Scientist, Aron research Center, Bangalore, Special invitee.
18. Dr Rama Mohan, Hindupur, Special invitee.

Members Absent:

1. Dr N Venkat Ram, Professor & Dean Academics, KLEF, Special Invitee.

Dr. J. V. Shanmukha Kumar, the Chairman of the Board of Studies, initiated the meeting by warmly welcoming and introduced the external members to the internal and co-opted members. He expressed his gratitude to them for agreeing to join the Board of Studies.

After due deliberations, the following resolutions have been adopted.

1/10/2019
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AGENDA and RESOLUTIONS

Agenda Item 1:

Endorse the introduction of new courses into the curriculum for the 2019 batch of the M. Sc Chemistry program.	Recommended for approval in academic council.

Discussion:

In light of feedback from stakeholders, including Dr. A Venkateswara Rao, Assistant Professor at KLEF, and Mr. D Kishore Babu (ID No. 182230002), the Chairman of the Board of Studies showcased the comprehensive M. Sc Chemistry curriculum for the 2019 batch to all members. After careful consideration, the Board members proposed several changes to the curriculum by proposing the introduction of new courses and recommended these for approval by the academic council.

Resolution:

- It was resolved and proposed to introduce "Chemistry of Drugs and Pharmaceuticals" as a Professional elective. This course inclusion highlights its importance in providing specialized knowledge in the field of medicinal chemistry and pharmaceuticals, reflecting an advanced area of study within the discipline.

- It was resolved and recommended to the academic council for approval to introduce "Sensor Techniques and Body Fluid Analysis" as a professional elective course. The proposal highlights the importance of expanding the curriculum to include advanced topics that are both relevant and valuable for students' professional development.

(Annexure I: The detailed syllabus is given in annexure I)

Agenda Item 2:

Resolution and Recommendation of Updated M. Sc Chemistry Curriculum for 2019 Admitted Batch.	Recommended for approval in academic council.

Discussion:

In light of feedback from stakeholders (Dr. B Pradeep Kumar, Asst. Prof. at KLEF; Dr. J V Shanmukha Kumar, Prof. at KLEF; Mr. T Trinadh, ID No. 182230009; Dr. A. Ramachandraiah, Prof. at NIT Warangal; Dr. M V Basaveswara Rao, Prof. at Krishna University; Dr. K. Nageswara Rao from Trimax Biosciences; Dr. G. Raj Kumar from Aron Research Center), the Chairman of the Board of Studies introduced the comprehensive M. Sc Chemistry curriculum for the Academic Year- 2019 to the members. Following up the thoughtful discussions, the BOS members proposed certain changes and updates to the curriculum and recommended its approval by the academic council.

1/10/2019

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Resolution:

- It was resolved and recommended for approval in the academic council to change the course Photo Chemistry & Pericyclic reactions from Prof. Core to Prof. Elective (Syllabus Modified accordingly) respectively.

- It was resolved and recommended for approval in academic council to change the course Advanced Heterocyclic Chemistry from Prof. elective to Prof. core (Syllabus Modified accordingly) respectively.

- It was resolved and recommended for approval in academic council to change the course Natural Products & Biomolecules from Prof. elective to Prof. core (Syllabus Modified accordingly) respectively.

(Annexure II: The detailed syllabus is given in annexure II)

Agenda Item 3:

Resolution and Recommendation of DAC Meeting Minutes (Dated 2-05-2019)	Recommended for approval in academic council.

Discussion:
The Departmental Academic Committee (DAC) deliberated and decided to implement the following recommendations:

1. In order to meet the industrial requirements, the priority of the courses to be modified.
2. In Semester-3: Separation Techniques-I (18CY2111)(L-T-P-S: 4-0-6-0) course which was earlier floated as a professional core has been made as an Prof. elective course for which course code has been changed as 18CY2114 along with L-T-P-S structure (L-T-P-S: 3-0-0-0).
3. In Semester-3: Instrumental Methods of Analysis (18CY2114))(L-T-P-S:3-0-0-0) course which was earlier floated as a dept., elective has been made as Professional core for which Course Title and code along with L-T-P-S has been modified as Instrumental Methods of Analysis-I and 18CY2111 (L-T-P-S: 4-0-6-0).
4. In Semester-4: Separation Techniques-II (18CY2211)(L-T-P-S: 4-0-6-0) course which was earlier floated as a professional core has been made as an Prof. elective course for which course code has been changed as 18CY2214 along with L-T-P structure (L-T-P-S: 3-0-0-0).
5. In Semester-4: Advanced Instrumental Methods of Analysis (18CY2215) (L-T-P: 3-0-0) course which was earlier floated as a Prof. elective has been made as Professional core for which Course Title and code along with L-T-P-S has been modified as Instrumental Methods of Analysis-II and 18CY2211 (L-T-P: 4-0-6-0).
6. In Semester-4: Advanced Applied Analysis (18CY2214) (L-T-P:3-0-0) course which was earlier floated as a dept., elective has been made as Professional core for which Course code along with L-T-P-S has been modified as 18CY2212 (L-T-P: 4-0-6-0).

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7. The Laboratory component was also framed for Instrumental methods of analysis-I (18CY2111), Instrumental methods of analysis-II (18CY2211) and Advanced Applied Analysis (18CY2212).

8. Reaction Mechanism & Named reactions Prof. Core Removed.
9. Natural Products & Biomolecules Prof. elective. to Prof core.
10. Techniques for Modern industrial techniques removed.

Resolution:
The minutes of the Departmental Academic Committee (DAC) meeting held on May 2, 2019, were reviewed, endorsed, and recommended for approval in academic council.

(Annexure I & II)

AGENDA ITEM-4

Initiation of Dissertation Work leading to publication in the 3rd Semester starting from the Academic Year 2019-20.	Recommended for approval in academic council.

Discussion:

Based on the stakeholder feedback (Dr. E. Hari Krishna, Asst. Prof., KLEF; Dr. K. Ravindranath, Prof., KLEF; Dr. Anindita Chatterjee, Asst. Prof., KLEF) it was suggested that the dissertation work for students should commence in the 3rd semester instead of the 4th semester and propose that these dissertations be published beginning with the 2019-20 academic year.

Resolution:

- It was resolved and recommended for approval in academic council to include Dissertation with research Publication course to Y19 Curriculum from academic year 2019-20 and mandatory to publish an article in Scopus-indexed journal which could be useful for getting placement & appearing for higher studies.

- It is resolved and recommended for approval in academic council to initiate dissertation work in 3rd semester instead of 4th semester to get academic publication could be useful for getting placement & appearing for higher studies.

11/10/2019

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SL.NO	FULL NAME	DESIGNATION	ORGANIZATION	POSITION IN THE MEETING	SIGNATURE
1	Dr. J. V. Shanmukha Kumar	BOS Chair	KLEF, Vaddeswaram	BOS CHAIR	11/10/2019
2	Dr. M.V.Basaveswara Rao	External Member	Professor, Krishna University, Tirupati	Member	
3	Dr. A. Ramachandraiah	External Member	Professor, NIT Warangal	Member	
4	Dr. Y. Anjaneyulu	Member	KLEF, Vaddeswaram	Member	
5	Dr. K. Ravindhranath	Member	KLEF, Vaddeswaram	Member	
6	Dr. A. Vani	Member	KLEF, Vaddeswaram	Member	
7	Dr. K R S Prasad	Member	KLEF, Vaddeswaram	Member	
8	Dr. M. Sujatha	Member	KLEF, Vaddeswaram	Member	
9	Dr. T. Bhaskara Rao	Member	KLEF, Vaddeswaram	Member	
10	Dr. S. Naresh Varma	Member	KLEF, Vaddeswaram	Member	
11	Dr. A. Venkateswara Rao	Member	KLEF, Vaddeswaram	Member	11/10/2019
12	Dr. Pradeep Kumar Brahmin	Member	KLEF, Vaddeswaram	Member	
13	Dr. N VenkatRam, Professor & Dean Academics	Special Invitee	KLEF, Vaddeswaram	Special Invitee	
14	Dr. K. Nageswara Rao	Special Invitee	M/S Trimax Biosciences, Raichur, Karnataka	Special Invitee	
15	Dr. Rajkumar Gangula	Special Invitee	Principal Scientist, Aron Research Center, Bangalore	Special Invitee	
16	Dr. Rama Mohan Hindupur	Special Invitee	Manager, Dr Reddy's Laboratories	Special Invitee	
19	Dr. B. V. Appa Rao, Mathematics	Special Invitee	KLEF, Vaddeswaram	Special Invitee	
20	Dr. G. Sunita Sundari, Physics	Special Invitee	KLEF, Vaddeswaram	Special Invitee	

11/10/2019

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1. **Program structure (with all Courses) containing following categorization:**

Course Code	Course Name	Course Category	L	T	P	S	CR	Pre-Requisite	New Course/Revised Course/ Retained Course	Changes Proposed by	Focused on Employability/Entrepreneurship/Skill Development	Justification
19CY5101	General Chemistry-I	Prof. Core	4	0	0	0	4	-	**Retained**	**NA**	Employability	Covers the Theory Concepts which helps the students for attaining better employment
19CY5102	Inorganic Chemistry- I	Prof. Core	4	0	6	0	7	-	**Retained**	**NA**	Employability	Covers the Concepts at molecular level which helps the students for attaining better employment
19CY5103	Organic Chemistry-I	Prof. Core	4	0	6	0	7	-	**Retained**	**NA**	Employability	Covers the Industrial Concepts which helps the students for attaining better employment
19CY5104	Physical Chemistry-I	Prof. Core	4	0	6	0	7	-	**Retained**	**NA**	Employability	Understand more about the progress of the reaction & mechanism of the reactions

10/10/2019

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19CY5201	General Chemistry-II	Prof. Core	4	0	0	0	4	-	**Retained**	**NA**	Employability	Covers the Theory Concepts which helps the students for attaining better employment
19CY5202	Inorganic Chemistry- II	Prof. Core	4	0	6	0	7	-	**Retained**	**NA**	Employability	Covers the Concepts at molecular level which helps the students for attaining better employment
19CY5203	Organic Chemistry-II	Prof. Core	4	0	6	0	7	-	**Retained**	**NA**	Employability	Covers the Industrial Concepts which helps the students for attaining better employment
19CY5204	Physical Chemistry-II	Prof. Core	4	0	6	0	7	-	**Retained**	**NA**	Employability	Understand more about the progress of the reaction & mechanism of the reactions
19CY5301	Instrumental Methods of Analysis-I	Prof. Core	4	0	6	0	7	-	**Retained**	**NA**	Skill Development	Covers the Industrial Concepts which helps the students for attaining better employment
19CY5302	Quality Control and Traditional Methods of	Prof.	4	0	0	0	4	-	**Retained**	**NA**	Skill	Covers the

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	Analysis-I	Core									Development	Industrial Concepts which helps the students for attaining better employment
19CY5303	Applied Analysis-I	Prof. Core	4	0	6	0	7	-	**Retained**	**NA**	Employability	Understand more about the progress of the reaction & mechanism of the reaction
19CY5310	Organic Synthesis-I	Prof. Core	4	0	6	0	7	-	**Retained**	**NA**	Employability	Covers the Industrial Concepts which helps the students for attaining better employment
19CY5311	Natural Products and Biomolecules	Prof. Core	4	0	6	0	7	-	**Modified**	**Academic Peers & Industry Persons**	Skill Development	Covers the Industrial Concepts which helps the students for attaining better employment
19CY5312	Organic Spectroscopy	Prof. Core	4	0	0	0	4	-	**Retained**	**NA**	Employability	Covers the characterization of compounds & materials
19CY5401	Instrumental Methods of Analysis-II	Prof. Core	4	0	6	0	7	-	**Retained**	**NA**	Employability	Covers the Industrial Concepts which helps the

10/2019

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												students for attaining better employment
19CY5402	Advanced Applied Analysis	Prof. Core	4	0	6	0	7	-	**Retained**	**NA**	Employability	Covers the Industrial Concepts which helps the students for attaining better employment
19CY5403	Dissertation with Research Publication	Skill Development	0	0	12	0	6	-	**Retained**	**NA**	Skill Development	Student will get the more knowledge about the research orientation subject.
19CY5407	Organic Synthesis-II	Prof. Core	4	0	6	0	7	-	**Retained**	**NA**	Employability	Covers the Industrial Concepts which helps the students for attaining better employment
19CY5408	Advanced Heterocyclic chemistry	Prof. Core	4	0	6	0	7	-	**Modified**	**Industry Peers**	Employability	Covers the Industrial Concepts which helps the students for attaining better employment
19CY5409	Dissertation with Research Publication	Skill Development	0	0	12	0	6	-	**Retained**	**NA**	Skill Development	Student will get the more knowledge about the research

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												orientation subject.
19CY5304	Separation Techniques-I	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5305	Applications of Chemical Spectroscopy	Prof. Elective	3	0	0	0	3	-	**Modified**	**Academic Peers**	Skill Development	Covers the Industrial Concepts which helps the students for attaining better employment
19CY5306	Bio analytical Chemistry	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5307	Environmental Chemistry	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the chemicals & materials in the eco friendly manner.
19CY5308	Surface Analytical Techniques	Prof. Elective	3	0	0	0	3	-	**Modified**	**Academic Peers**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5309	Analysis of Food and Drugs	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5313	Photo Chemistry and Pericyclic reactions	Prof. Elective	3	0	0	0	3	-	**Modified**	**Academic Peers**	Skill Development	Concepts will help in handling the instruments

1/10/2019

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												in the industry
19CY5314	Organometallic Chemistry	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5315	Bio Organic Chemistry	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5316	Green Chemistry	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5317	Food Chemistry	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5318	Medicinal chemistry	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5404	Separation Techniques-II	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5405	Quality Control and Traditional Methods of Analysis-II	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5406	Sensor techniques and body fluid analysis	Prof. Elective	3	0	0	0	3	-	**NEW**	**BOS Members**	Skill Development	Concepts will help in handling the instruments in the industry

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19CY5410	Advanced Organic Spectroscopy	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5411	Chemistry of Drugs and Pharmaceuticals	Prof. Elective	3	0	0	0	3	-	**NEW**	**BOS Members**	Skill Development	Concepts will help in handling the instruments in the industry
19CY5412	Nano Chemistry	Prof. Elective	3	0	0	0	3	-	**Retained**	**NA**	Skill Development	Concepts will help in handling the instruments in the industry

Percentage of Syllabus Revision=7/38= 7/38 = 20%

Percentage of Courses focusing on Employability= 15/38=40%

Percentage of Courses focusing on Entrepreneurship= Nil

Percentage of Courses focusing on Skill Development = 23/38=60%

1/10/2019

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Program structure

S.No	Course Code	Course Name	Category	L	T	P	S	Cr
1	19CY5101	General Chemistry-I	Prof. Core	4	0	0	0	4
2	19CY5102	Inorganic Chemistry- I	Prof. Core	4	0	6	0	7
3	19CY5103	Organic Chemistry-I	Prof. Core	4	0	6	0	7
4	19CY5104	Physical Chemistry-I	Prof. Core	4	0	6	0	7
5	19CY5201	General Chemistry-II	Prof. Core	4	0	0	0	4
6	19CY5202	Inorganic Chemistry- II	Prof. Core	4	0	6	0	7
7	19CY5203	Organic Chemistry-II	Prof. Core	4	0	6	0	7
8	19CY5204	Physical Chemistry-II	Prof. Core	4	0	6	0	7
9	19CY5301	Instrumental Methods of Analysis-I	Prof. Core	4	0	6	0	7
10	19CY5302	Quality Control and Traditional Methods of Analysis-I	Prof. Core	4	0	0	0	4
11	19CY5303	Applied Analysis-I	Prof. Core	4	0	6	0	7
12	19CY5310	Organic Synthesis-I	Prof. Core	4	0	6	0	7
13	19CY5311	Natural Products and Biomolecules	Prof. Core	4	0	6	0	7
14	19CY5312	Organic Spectroscopy	Prof. Core	4	0	0	0	4
15	19CY5401	Instrumental Methods of Analysis-II	Prof. Core	4	0	6	0	7
16	19CY5402	Advanced Applied Analysis	Prof. Core	4	0	6	0	7
17	19CY5403	Dissertation with Research Publication	SKILL Development	0	0	12	0	6
18	19CY5407	Organic Synthesis-II	Prof. Core	4	0	6	0	7
19	19CY5408	Advanced Heterocyclic chemistry	Prof. Core	4	0	6	0	7
20	19CY5409	Dissertation with Research Publication	SKILL Development	0	0	12	0	6
21	19CY5304	Separation Techniques-I	Prof. Electives	3	0	0	0	3
22	19CY5305	Applications of Chemical Spectroscopy	Prof. Electives	3	0	0	0	3
23	19CY5306	Bio analytical Chemistry	Prof. Electives	3	0	0	0	3
24	19CY5307	Environmental Chemistry	Prof. Electives	3	0	0	0	3
25	19CY5308	Surface Analytical Techniques	Prof. Electives	3	0	0	0	3
26	19CY5309	Analysis of Food and Drugs	Prof. Electives	3	0	0	0	3

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27	19CY5313	Photo Chemistry and Pericyclic reactions	Prof. Electives	3	0	0	0	3
28	19CY5314	Organometallic Chemistry	Prof. Electives	3	0	0	0	3
29	19CY5315	Bio Organic Chemistry	Prof. Electives	3	0	0	0	3
30	19CY5316	Green Chemistry	Prof. Electives	3	0	0	0	3
31	19CY5317	Food Chemistry	Prof. Electives	3	0	0	0	3
32	19CY5318	Medicinal chemistry	Prof. Electives	3	0	0	0	3
33	19CY5404	Separation Techniques-II	Prof. Electives	3	0	0	0	3
34	19CY5405	Quality Control and Traditional Methods of Analysis-II	Prof. Electives	3	0	0	0	3
35	19CY5406	Sensor techniques and body fluid analysis	Prof. Electives	3	0	0	0	3
36	19CY5410	Advanced Organic Spectroscopy	Prof. Electives	3	0	0	0	3
37	19CY5411	Chemistry of Drugs and Pharmaceuticals	Prof. Electives	3	0	0	0	3
38	19CY5412	Nano Chemistry	Prof. Electives	3	0	0	0	3

1/10/2019

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Annexure I:

19CY5406-SENSOR BASED TECHNIQUES AND BODY FLUID ANALYSIS

L-T-P-S : 3-0-0-0
Credits : 3
Contact Hours : 3

Course outcomes of 19CY5406

CO#	Course Outcome	PO/PSO	BTL
CO1	Understand the principles of various chemical sensors.	PO-2,3	3
CO2	Analysis of biomolecules in body fluids	PO-1,2,3	3
CO3	Employ analytical techniques in the determination of vitamins	PO-2,3,6	3
CO4	Apply Immuno analytical Techniques in clinical analysis	PO-3,4,5	3

Syllabus:

Chemical Sensors: Introduction, definitions, Classification of chemical sensors, descriptions of chemical sensors (electrochemical sensors, potentiometric sensors, voltametric chemical sensors, sensors based on conducting properties), Optical sensors (light guides, the evanescent wave, design of fiber optic sensor, indicator mediated sensor), Calorimetric sensors (catalytic gas sensor, thermal conductivity sensor), mass sensor (piezoelectric quartz crystal resonator, surface acoustic wave sensor). **Biosensors in analysis:** Introduction, producing biological surface, Achievement of bio transduction (amperometric, potentiometric, optical). **Collection of Specimens:** Blood: Collection of Blood specimens, storage and preservation, Urine: Collection of Urine, physical characteristics of urea, preservation and storage, Faeces: Collection and preservation. **Analysis of Blood and urine**: Determination of blood and plasma glucose by glucose oxidase method, Determination of urine for glucose, Determination of ketone bodies in blood, Determination of serum creatinin, estimation of serum bilirubin, Estimation of serum cholesterol, determination of blood hemoglobin, Determination of urea in urine by urease method and by direct colorimetry. **Determination of vitamins in body fluid:** Classification of vitamins with example, Each vitamin must be explained with respect of functions, deficiency diseases, daily requirement, and analytical method i) Retinol (determination of retinol and serum carotene in serum using TFA), Vit D3 (Cholecalciferol), Vitamin E (Tocopherols, Determination of serum tocopherol by spectrophotometry by dipyridyl method), Vitamin B1 (thiamine determination by flurometry), Vitamin B2 (riboflavin, Photofluorometric method), Vitamin B6 (Pyidoxine, Fluorometric determination of Xanthuric acid), Nicotinic acid and Niacin: determination by fluorometry, Ascorbic acid (vitamin –c) Volumetric method using 2,6 dichlorophenol method, colorimetric determination of leucocyte ascorbate. **Immunoanalytical Techniques:** Radioimmunoassay, its principle and applications, instrumentation for radio bioassay, clinical application of the radioimmunoassay of insulin, Estrogen and progesterone, receptor techniques of breast cancer. Enzyme- linked immunosorbent assay (ELISA), Types of ELISA, principles, practical aspects, applications.

11/10/2019

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TEXTBOOKS:

1) Standard methods of chemical analysis by F.J. Welcher, 6th Edition,.
2) Quantitative Inorganic Analysis including Elementary Instrumental analysis by A. I. Vogel, 3rd Edition, ELBS, 1964.
3) Instrumental methods of analysis by R. D. Braun
4) Analytical Chemistry, Ed. by Kellner, Mermet, otto, Valcarcel, Widmer, Second Ed. Wiley –VCH
5) Practical Clinical Biochemistry by Gowenlock, CBS published, 6th Ed.
6) Biochemical methods of analysis by S. Sadasivam and A. Manickam, Narosa Publication

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19CY5411-CHEMISTRY OF DRUGS AND PHARMACEUTICALS

L-T-P : 3-0-0
Credits : 3
Contact Hours : 3

CO#	Course Outcome	PO	BTL
CO1	Understand the medicinal and pharmaceutical importance of the organic compounds.	1,2	3
CO2	Explain the Chemical and Biological assay of the various class of compounds.	1,2	3
CO3	Describe the structure and properties of Vitamins: A, B, C, D, E and K; Hormones: Sex hormones, Steroidal and Non-steroidal hormones, Adrenaline, Thyroxine and Cardiac glycosides etc.,	1,4,5	3
CO4	Paraphrase the Pharmacological activity, uses and limitations of Antipyretics, Analgesics, Sedatives, Hypnotics, Barbiturates, Sulpha drugs, Anesthetics, Antiseptics, Antibacterials, Diuretics, Anthelmintics, Anticoagulants, Anticonvulsants, Antihistamines, Psychotherapeutics.	1,2,3,	3

Syllabus:

Chemical and Biological assay of the following compounds: Vitamins: A, B, C, D, E and K; Hormones: Sex hormones, Steroidal and Non-steroidal hormones, Adrenaline, Thyroxine and Cardiac glycosides. Penicillin, Streptomycin, Chloromycetin, Tetracyclins, Novobiocin and Cephalosporins. Pharmacological activity uses and limitations of Antipyretics, Analgesics, Sedatives, Hypnotics, Barbiturates, Sulpha-drugs, Anesthetics, Antiseptics, Antibacterials, Diuretics, Anthelmintics. Anticoagulants, Anticonvulsants, Antihistamines, Psychotherapeutics.

TEXTBOOKS:

1) The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1, 5th Edition, John Wiley & Sons, 2001.
2) Organic Chemistry by IL Finar, Vol. I and II, 5th Edition, ELBS, 2004.
3) Graham L. Patrik, Drug Design and Development, Elsevier Publisher, 2002.

Annexure II:

To resolve and recommend the modified courses in curriculum for 2019 admitted batch of M. Sc Chemistry programme.

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ANNEXURE II: Resolution and Recommendation of Updated M. Sc Chemistry Curriculum for 2019 Admitted Batch.

19CY5305-APPLICATIONS OF CHEMICAL SPECTROSCOPY

L-T-P-S : 3-0-0-0
Credits : 3
Contact Hours : 3

CO#	Course Outcome	PO/PSO	BTL
CO1	Discuss the fundamental principles of basic characterization techniques.	1,4	3
CO2	Apply NMR techniques in the elucidation of complex molecules.	1,2	3
CO3	Determination of elemental or isotopic signature of sample.	2,3	3
CO4	Identification of chemical structure of a molecule by spectroscopy.	3,4,5	3

Syllabus:

Infrared Spectroscopy: Fourier Transform infrared spectroscopy: Applications. Ultraviolet and visible spectroscopy: Applications of UV-Visible spectroscopy, Nuclear Magnetic Resonance Spectroscopy:Applications of AB, AX, ABC, AMX Systems; double resonance, Lanthanide shift reagents; Carbon-13 NMR spectroscopy; COSY, NOE, FT NMR, 2D NMR and CIDNP.Mass Spectrometry: Fragmentation: McLafferty rearrangement. Particle bombardment methods, PD, SIMS, FAB, Gas chromatography-mass spectrometry, MS data system.Combined Applications: UV, IR, NMR and Mass in the elucidation of molecular structure.

TEXTBOOKS:

1) Introduction to Spectroscopy by Donald L. Pavia and Gary M Lanyman, 3rd Edition, Thompson Publishers, 2008.
2) Spectroscopy of Organic Compounds by P.S. Kalsi, 6th Edition, New Age International Publishers, 2004.
3) Elementary Organic Spectroscopy-Principles and Applications by Y. R. Sharma, 5th Edition, S. Chand Publishers, 2007.

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19CY5308-SURFACE ANALYTICAL TECHNIQUES

L-T-P-S : 3-0-0-0
Credits : 3
Contact Hours : 3

CO#	Course Outcome	PO/PSO	BTL
CO1	Understand the basic principles of Electron Spectroscopy for Chemical Analysis.	1,2	3
CO2	Employ Surface enhanced Raman Spectroscopy (SERS) in mapping and imaging.	2,3,6	3
CO3	Describe Electron Energy Loss Spectroscopy.	1,2	3
CO4	Apply Low Energy Ion Scattering Spectroscopy for Surface structural analysis.	1, 4,5	3

Electron Spectroscopy for Chemical Analysis (ESCA): Principles, Instrumentation, and Analytical Applications. Auger electron spectroscopy: Principles, Instrumentation, Applications. Secondary ion mass spectrometry (SIMS): Principles, Instrumentation, Applications.Surface enhanced Raman Spectroscopy (SERS): Principles, Instrumentation, Nanoparticulate SERS substrates, Surface enhanced resonance Raman scattering (SERRS), SERRS of Ag and Au metal colloids, Thin solid films, Langmuir-Blodgett Monolayers, SERRS, Mapping and imaging, Applications.
Electron Energy Loss Spectroscopy (EELS): Principles, Instrumentation, Applications. Electron Microprobe analysis: Principles, Instrumentation, Analysis of semiconductors and crystalline materials, Applications. Low Energy Ion Scattering Spectroscopy: Principle, Instrumentation, Surface structural analysis

TEXTBOOKS:

1) Surface Analysis Methods in Materials Science by D J O'Connor, Brett A Sexton, Roger S C Smart (Eds), 2nd Edition, Springer, 2010.
2) Surface Analysis: The Principal Techniques by John C Vikerman, Ian Gilmore (Eds.), 2nd Edition, Wiley, 2009.
3) An Introduction to Surface Analysis by John F Watts and John Wolstenholme, 2nd Edition, Wiley VCH, 2011.

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19CY5313-PHOTO CHEMISTRY AND PERICYCLIC REACTIONS

L-T-P-S : 3-0-0-0
Credits : 3
Contact Hours : 3

CO#	Course Outcome	PO/PSO	BTL
CO1	Ability to apply nucleophillic / electrophillic pathway to synthesize new organic entities	2,3	3
CO2	Apply aromatic nucleophillic and free radical substitution mechanisms in new chain linkages	1,3	3
CO3	Understand organic reaction mechanism in terms of pericyclic reactions at different conditions.	3,4	3
CO4	Ability to explain pericyclic reactions involved in various organic rearrangement reactions.	1,5,6	3

Syllabus:

Advanced organic named reactions with mechanisms: Baylis- Hillman reaction, Mitsunobu reaction, Pechmann condensation, Roush coupling, Shapiro reaction, Suzuki coupling.Fundamental concepts, Jablonski diagram, Energy transfer and characteristics of photo reactions. Photo reduction and photo oxidation, photo reactions of ketones and enones, Norrish Type I and II reactions. Photochemistry of alkenes, dienes and aromatic compounds, reactions of un-activated centres–Photolytic cycloadditions and photolytic rearrangements – Photosenstitisation –Photoadditions – Barton reaction – Parterno Buchi reaction. Concerted reactions – stereochemistry-orbital symmetry and concerted symmetry and correlation diagram –Frontier molecular orbital approach, Woodward and Hoffmann rules – Electrocyclic reactions – cycloaddition reactions.Sigmatropic rearrangements – selection rules and examples with simple molecules – 1,3 and 1,5 hydrogen shifts –Cope and Claisen rearrangements.

TEXT BOOKS:

1) Advanced Organic Chemistry: Reactions Mechanisms and Structure by Jerry March, Mc.Graw Hill and Kogakush.
2) Molecular reactions and Photochemistry by Charles Dupey and O. Chapman, Prentice Hall.
3) Pericyclic reactions by S.N. Mukharji, Mcmilan.
4) The modern structural theory in Organic Chemistry by L.N.Ferguson, Pretice Hall
5) Physical Organic Chemistry by Jack Hine, Mc. Graw Hill
6) Mechanisms and Theory in Organic Chemistry by T.H. Lowery and K.S. Rich gardson.

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19CY5311-NATURAL PRODUCTS AND BIOMOLECULES

L-T-P-S : 4-0-6-0
Credits : 7
Contact Hours : 10

CO#	Course Outcome	PO/PSO	BTL
CO1	Illustrate the synthesis and significance of microbial metabolites	1,4	3
CO2	Outline the origin & chemical nature of Terpenes	1,3,5	3
CO3	Outline the origin & chemistry of Alkaloids	1,2,3	3
CO4	Demonstrate properties & synthetic methods of peptides	4,5	3
CO5	Ability to isolate and estimate the bioactive compounds from various plant extracts	2,3	3

Syllabus:

Structure, isolation, stereochemistry and synthesis of the following class of natural products from plant, animal and microbial sources: Acetogenins and shikimates: Microbial metabolites: Pencillin G, Cephalosphorin-Ö and streptomycin. Terpenoids: Forskolin, taxol and azadirachtin.Biogenesis and biological properties of the Pencillin G, Cephalosphorin-Ö and streptomycin, Terpenoids: Forskolin, taxol and azadirachtin.Structure, isolation, stereochemistry and synthesis of the following class of natural products from plant, animal and microbial sources: Alkaloids: Morphine, reserpine and vincristine Biopolymers: Peptides: α-Aminoacids. Synthesis of peptides by Merrifield solid phase synthesis. Chemistry of oxytocin and dolastain-10.

List of Experiments: 1.Estimation of Hydroxyl group by acetylation or phthalation method.2.Estimation of phenol by bromination method.3.Estimation of aniline by Bromination method.4.Estimation of Carbonyl Groups by Hydrogen formation method.5.Estimation of sugars by using Fehling's method.6.Estimation of Vitamin-C in lime Juice.7.Isolation of Caffeine from tea.8.Isolation of Lycopene from Tomatoes.9.Isolation of Lactose from Milk.10.Isolation of Citric Acid from Lemon

TEXTBOOKS:

1. Organic Chemistry by I.L. Finar Vol. I and II, 9th Edition, Pearson, 2009.
2) Medicinal Chemistry by Graham L. Patrick, Oxford University Press, 2005.
3) Text book of Practical Organic Chemistry by Vogel

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19CY5408-ADVANCED HETEROCYCLIC CHEMISTRY

L-T-P-S : 4-0-6-0
Credits : 7
Contact Hours : 10

CO#	Course Outcome	PO/PSO	BTL
CO1	To classify, synthesis and reactivity of simple heterocyclic aromatic and non-aromatic compounds as electron deficient or electron rich and explain their reactivity based on these properties	1,2	3
CO2	Apply the aromaticity, reactivity and synthesis of Five, six membered heterocyclic compounds with two hetero atoms	1,2	3
CO3	Apply the aromaticity, reactivity and synthesis of heterocyclic compounds with more than hetero atoms	2,3	3
CO4	Apply the synthesis, structure, reactivity and stability of larger ring heterocyclics	1,3,4	3
CO5	Ability to synthesize heterocyclic compounds	2,4	3

Provide the knowledge of synthesis, structural reactivity of heterocyclic compounds.

Syllabus:

Nomenclature (Hantzsch Widman System), spectral characteristics, reactivity and aromaticity of monocyclic, fused and bridged heterocycles. Nonaromatic heterocycles. Different types of strains, interactions and conformational aspects on nonaromatic heterocycles. Synthesis, reactivity and importance of the following ring systems. Azirines, Oxaranes, Thiiranes, Diazirenes, Diaziridines, Azetidines. Five and six-membered heterocycles with two hetero atoms: Synthesis, reactivity, aromatic character and importance of the following heterocycles: Pyrazole, Imidazole, Oxazole, Thiazole, Pyrimidine, Pyrazine, Oxazine, and Thiazine.Heterocycles with more than two hetero atoms: Synthesis, reactivity, aromatic character and importance of the following heterocycles: Triazoles, Oxadiazoles, Thiadiazoles, Triazines. Larger ring and other heterocycles: Synthesis and reactivity of Azepines, Oxepines and Thiepines.Synthesis and rearrangement of Diazepines. Synthesis of Benzoazepines, Benzodiazepines, Benzooxepines, Benzothiepines, Azocines, and Azonines. Banzanellated azoles and dipolar structures: Banzanellated azoles: Synthesis and reactivity of Benzimidazoles, Benzoxazoles and Benzothiazoles. Heterocyles with Ring-Junction nitrogen: Synthesis and reactivity of Quinolizines, Indolizines and Imidazopyridines. Heterocycles with dipolar structures.Betaines: Formation, aromaticity and reactivity of pyridine-N-oxides and pyridinium imides. Mesoionic heterocycles: Synthesis and aromaticity of sydnones and 1,3- dipolar addition reaction of mesoionic heterocycles.

Experiments: 1.Synthesis of Thiepine 2.Synthesis of benzophenone 3.Synthesis of diazotized compounds (Triazoles) 4.Synthesis of1,2,4- Triazole 5.Synthesis of Isoxazole 6.Synthesis of Ergotamine (Indole based alkaloid) 7.Synthesis of Cinchonine 8.Synthesis of Quinine 9.Synthesis of Prima Quinine.10.Synthesis of Acetazolamide

TEXT BOOKS:

1) Heterocyclic Chemistry by T.Gilchrist
2) An introduction to the Chemistry of heterocyclic compounds by R.M.Acheson

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3) Heterocyclic Chemistry by J.A.Joule&K.Mills
4) Principles of Modern Heterocyclie Chemistry by A.Paquette
5) Heterocyclic Chemistry by J,A.Joule& Smith
6) Handbook of Heterocyclic Chemistry by A.R.Katritzky
7) Aromatic character and aromaticity by G.M.Badger
8) Non-benzenoid aromatic compounds by D.Ginsberg
9) Nonbenzenoid compounds by Lloy

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18CY2114-SEPARATION TECHNIQUES-I

L-T-P : 3-0-0

Credits : 3

Contact Hours : 3

Chromatography: classification of different chromatographic methods, methods of development-Elution development, Gradient elution development, displacement development, and frontal analysis. Principles of chromatography, different migration, adsorption phenomena, partition, adsorption coefficient, retardation factor, retention time and volume, column capacity, temperature effects, partition isotherm. Dynamics of chromatography-efficiency of chromatographic column, zone spreading, High Equivalent Theoretical Plate (HETP), Van Deempter equation, resolution, choice of column, length and flow velocity, qualitative and quantitative analysis. **Column chromatography (adsorption chromatography):** principles, general aspects, adsorption isotherms, chromatographic media, nature of forces between adsorbent and solutes, eluents (mobile phase), column chromatography without detectors and liquid chromatography with detectors and applications.**Gel Exclusion chromatography or Gel filtration chromatography:** principles, properties of xerogels, apparatus and detectors, resolution of gel type, applications to organic compounds. **Capillary Electrophoresis:** Principle, Details of the Instrument, Applications to Inorganic and Organic compounds. **Gas chromatography:** Theory, Instrument description of equipment and different parts, columns (packed and capillary columns), detector specifications-thermal conductivity detector, flame ionization detector, electron capture detector, nitrogen-phosphorus detector, photo ionization detector, programmed temperature gas chromatography; applications in the analysis of gases, petroleum products etc., other detectors used their Principles and Applications.**Inorganic molecular sieves:** structure of zeolites, crystals, types of sieves, application in the separation of gases including hydrocarbons, ion exclusion-principles and applications, Counter current chromatography-principles and application, Affinity chromatography-principles and applications. **GC-MS-Introduction:** Instrumentation – GC – MS interface – Mass spectrometer (MS) Instrument operation, processing GC – MS data – ion chromatogram Library searching – Quantitative measurement-sample preparation Selected ion monitoring – Application of GC-MS for Trace constituents, Drugs analysis, Environmental analysis and others. **Liquid-liquid partition chromatography:** principle, supports, partitioning liquids, eluents, reverse phase chromatography, apparatus, applications. **High performance liquid chromatography:** Theory, Instrument description of the different parts of the equipment, columns, detectors-UV detector, refractometric detector, Fluorescence detector, Diode Array detector, applications in the separation of organic compounds, names of other detectors used their Principles and Applications.**LC-MS:** Introduction-Instrumentation-liquid chromatograph-Mass spectrometer Interface Instrumental details-Processing LC-MS data-ion chromatograms-Library searching-Quantitative measurements. Sample preparation – selected ion monitoring. Application of LC-MS for Drug analysis, Environmental samples and others.

TEXTBOOKS:

1. Techniques and practice of Chromatography by R.P.W Scott, Marel Dekker Inc., New York
2. Separation methods by M.N. Sastri, Himalaya Publishing Company, Mumbai

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REFERENCE BOOKS:

1. Chromatography by E. Helfman, Van Nostrand and Reinhold, New York
2. Chromatography by E. Lederer and M. Lederer, Elsevier, Amsterdam.
3. Chemical separation methods by John A Dean, Von Nostrand Reinhold, New York
4. Techniques and practice of Chromatography by R.P.W Scott, Marel Dekker Inc., New York
5. Basic Gas Chromatography by H.M Mc Nair and J. M. Miller, John Wiley, New York
6. Analytical Gas Chromatography by W. Jeumings, Academic Press, New York
7. Practice of HPLC by H. Eugelhardt (ed), Springer Verrag, Berrin

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18CY2111- INSTRUMENTAL METHODS OF ANALYSIS-I

L-T-P-S : 4-0-6-0
Credits : 7
Contact Hours : 10
Syllabus:

UV-Visible Spectroscopy: laws of absorption, deviation from Beer's law, single and double beam spectrophotometers-instrumentation, sources of radiation, detectors, qualitative analysis by absorption measurements, general precautions in colorimetric determinations, determination of certain metal ions by using ligands – Fe^{2+}, Fe^{3+}, Al^{3+}, NH^{4+}, Cr^{3+}, Cr^{6+}, Co^{3+}, Cu^{2+}, Ni^{2+} and anions – NO^{2-}, PO_4^{3-} using suitable reagents, simultaneous determinations of dichromate and permanganate in a mixture, spectrophotometric titrations, principle of diode array spectrophotometers. **Spectrofluorimetry:** Theory of fluorescence, phosphorescence, factors affecting the above, quenching, relation between intensity of fluorescence and concentration, instrumentation, application with reference to Al^{3+}, chromium salts, fluorescence, thiamin (B1) and riboflavin (B2) in drug samples.**Chemiluminescences:** Introduction, principle, types Measurement of chemiluminescence, Instrumentation quantitative chemiluminescences Gas phase chemiluminescence's analysis Chemiluminescences titrations, Electro-chemiluminescence.**Infrared spectroscopy:** Units of frequency, wavelength and wave number molecular vibrations, factors influencing vibrational frequencies, instrumentation, sampling techniques, detectors, characteristic frequencies of organic molecules, qualitative and quantitative analysis with reference to (petroleum refinery and polymer industry), selected molecules like CO, CO_2, non-destructive IR method for the analysis of CO and other organic compounds, principles of Fourier transform IR.**Mass Spectroscopy:** Principle, basic instrumentation, energetics of ion formation, types of peaks observed, resolution, qualitative analysis, molecular weight determination, quantitative analysis, advantages. **X-ray Spectroscopy:** chemical analysis by X-ray spectrometers, energy dispersive and wavelength dispersive techniques, evaluation methods, instrumentation, matrix effects, applications.**An Introduction to Microscopy (surface characterization techniques)** Limitations of the Human Eye, the X-ray Microscope, The Transmission Electron Microscope, The Scanning Electron Microscope, Scanning Transmission Electron Microscope, Analytical Electron Microscopy, Scanning-Probe Microscopes, the transmission electron microscope.

LAB:

List of Experiments:

Determination of alkalinity in a colored effluent using pH metric end point.2.Determination of purity of commercial HCl, H_2SO_4, H_3PO_4 and CH_3COOH using pH metric end point.3.Determination of Cr (VI) with Fe (II) using potentiometric end point.4.Determination of a mixture of Ce (IV) and V (V) with Fe (II) using potentiometric end point.5.Determination of a mixture of Mn (VII) and V (V) with Fe (II) using potentiometric end point.6.Determination of a mixture of bromide and chloride with $AgNO_3$ using potentiometric end point.7.Determination of KSCN with $AgNO_3$ using potentiometric end point.8.Estimation of aspirin from given tablet by spectrophotometry.9.Determination of Strength of commercial phosphoric acid by potentiometric titrations using standard solution of sodium hydroxide.10.To determine chloride and iodide from given mixture by potentiometry.11.Analysis of Riboflavin from vitamin supplementary capsules / syrup / tablet sample by Photoflurometry.12.Determination of relative strength of acetic acid, chloroacetic acid and trichloroacetic acid through measuring their Ka value by conductivity measurement

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method.13.Determination of commercial vinegar by potentiometric titration.14.Determination of boric acid by conductometry.15.Estimation of micronutrient from food by AAS (any two elements such as Fe, Cu, Zn, Mo, B, Mn)

TEXT BOOKS:

1) Instrumental methods of analysis by H.H Willard, Meritt Jr. and J.A Dean
2) Principles of instrumental analysis by Skoog and West
3) Vogels Textbook of Quantitative Inorganic analysis by J. Basset, R.C Denney, G.H Jefferey and J.Madhan
4) Instrumental methods of analysis by B.K Sarma, Goel Publishing House, Meerut
5) Instrumental methods of Analysis by Chatwal and Anand
6) Instrumental methods of Analysis by Ewing

REFERENCE BOOKS:

1) Introduction to instrumental analysis by R. D. Braun, Mc Graw Hill - International edition.
2) Analytical spectroscopy by Kamalesh Bansal, 1st edition.
3) Instrumental methods of chemical analysis by Willard, Dean and Merittee- 6th edition.
4) Analytical chemistry principles by John H. Kenedey- 2nd edition, Saunders college publishing.
5) Spectroscopic identification of organic compounds Fifth Edition by Silvestrine, Bassler, Morrill, John Wiley and sons.
6) Analytical Chemistry by Kellner, Mermet, otto, Valcarcel, Widmer, Second Ed. Wiley –VCH
7) Vogel's Textbook of quantitative Chemical Analysis, sixth Edition by Mendham, Denney,
   Barnes, Thomas, Pub: Pearson Education.
8) Electron Microscopy in the study of Material by P. J Grundy and G. A Jones.

1/10/2019

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18CY2214-ADVANCED APPLIED ANALYSIS

L-T-P-S : 3-0-0-0
Credits : 3
Contact Hours : 3
Syllabus:

Analysis of raw materials: Analysis of non-ferrous alloys: Brass – Analysis of the constituents – Cu, Zn, Sn, Pb and Fe. Bronze -Analysis of the constituents -Cu, Sn, Zn, Pb and Fe. Solder - Analysis of the constituents – Sn, Pb and Sb. Analysis of Ferro alloys : Ferro silicon - Analysis of the constituents – Si, C, P,S Ferro vanadium - Analysis of the constituents – V, C, P, S. Si, Al. Ferro manganese - Analysis of the constituents – Mn, S, C, P, Si Silico manganese -Analysis of the constituents –Mn, S, C, P, Si Ferro chromium - Analysis of the constituents – Cr, C, Si.**Analysis of Soil, Fertilizer and Fuel:** Analysis of soils: sampling, determination of moisture, total N, P, Si, lime, humus nitrogen, alkali salts, soil absorption ratio. Analysis of fertilizers: ammonical fertilizers, Phosphate fertilizers, Nitrate fertilizers. Analysis of fuels: solid fuels-coal, proximate analysis, ultimate analysis, heating value, grading of coal based on Ultimate Heat Value (UHV).**ASSESSMENT OF AIR QUALITY:** Composition of Pure Air, Classification of Air Pollutants, Toxic Elements Present in Dust and their Sources – Collection of Air Samples.

Sources, Effects, Control of Pollution and Chemical Analysis for the following. Primary Pollutants:Carbon compounds - Carbon monoxide(CO) and Carbon dioxide(CO_2). Sulphur compounds- sulphur dioxide (SO_2), Sulphur trioxide (SO_3) and Hydrogen Sulphide (H_2S). Nitrogen compounds - nitric oxide (NO), and nitrogen dioxide (NO_2), Hydrocarbons - Aliphatic hydrocarbons and polycyclic aromatic hydrocarbons (PAH). Particulate matter - Repairable and Suspended particulate matter, Inorganic and Organic particulates. Secondary pollutants - ozone (O_3), peroxy acetyl nitrate (PAN), peroxy benzyl nitrate (PBN), Standards for ambient air quality. **Kinetic Methods of Analysis & Non aqueous Titrimetry:** Kinetic methods of analysis: introduction, slow reactions, catalyzed reactions, methods of determination of catalyst concentration, extrapolation method for the determination of catalyst, variable time method, fixed time method, examples for the determination of toxic metals and anions using some typical kinetic reactions.**Non aqueous titrimetry:** Classification of solvents and titrations for non aqueous titrimetry- Types of reactions – Indicators. Determination of acids Determination of bases Karl-Fisher reagent for the determination of moisture content in drugs and other samples.

TEXT BOOKS:

1) Chemical analysis by H.A Laitinan, Mc Graw Hill Book Co.2.Standard methods of Chemical Analysis by Welcher.3.Technical Methods of Analysis by Griffin, Mc Graw Hill.4.Commercial Methods of Analysis by Foster Dee Sneel and Frank M. Griffin, Mc Graw Hill Book Co.5.Environmental Chemistry by Anil Kumar De, Wiley Eastern Ltd.6.Environmental Analysis by S.M Khopkar (IIT Bombay).7.Environmental Air Analysis by Trivedi and Kudesia, Akashdeep Pub.

7/10/2019

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18CY2211-INSTRUMENTAL METHODS OF ANALYSIS-II

L-T-P-S : 4-0-6-0

Credits : 7

Contact Hours : 10

Syllabus:

Electro analytical Methods of Analysis: Polarographic principles, Instrumentation (different types of microelectrode such as dropping mercury electrode, the static drop mercury electrode, rotating disc and ring disc electrode, cell for polarography, reference and counter electrode and circuit diagram), polarogram and polarographic currents, charging or capacitive current, role of supporting electrolyte, factors affecting on polarographic wave, Ilkovic Equation, advantages and disadvantages of DME, polarographic maxima and maxima suppresors, interference due to dissolved oxygen, Applications (qualitative analysis, quantitative analysis by calibration curve and standard addition methods), specific examples of analysis–analysis of Cu, Cd, Zn, Pb, etc. from tap water and alloys., problems. **Pulse Polarography:** different types of excitation signals in pulse polarography, Differential pulse polarography, square wave polarography, Stripping method. Voltametry with ultra microelectrode, Applications of these techniques Cu and Zn from tap water by differential pulse polarography and by square wave polarography, Vitamin-C by differential pulse polarography **Anode stripping voltametry:** principle, instrumentation, Hanging mercury drop electrode, application in the analysis of Pb and Cd in environmental samples, principle of cathode stripping voltammetry. **Principle of cyclic Voltammetry**, cyclic voltamogram of $K_3[Fe(CN)_6]$, and parathion, criteria of reversibility of electrochemical reactions, quasireversible and irreversible processes. **Coulometric analysis:** principles of coulometric analysis with constant current, coulometric analysis with controlled potential, applications of coulometric methods for the analysis of cations-As (III), Fe (II) and I^- and S^{2-} by using I_2 liberations and Ce^{4+} liberation in solutions **Spectro-Analytical Methods Of Analysis: Flame photometry:** theory, instrumentation, combustion flames, detectors, and analysis of Na, K, Ca, Mg etc. **Atomic Absorption Spectrometer:** theory, instrumentation, flame and non-flame techniques, resonance line sources, hollow cathode lamp, instrumentation, chemical and spectral interferences, applications with special reference to analysis of trace metals in oils, alloys and toxic metals in drinking water and effluents. **Inductively coupled plasma spectrometer (ICP-AES, ICP-MS):** principles, instrumentation, plasma, AES detectors, quadrupole mass spectrometers, difference between the two detectors, analysis methods for liquids and solids, applications in the analysis of trace and toxic metals in water, geological and industrial samples **Thermal methods of Analysis:** Thermo gravimetry-theory, instrumentation, applications with special reference to $CuSO_4.5H_2O$, $CaC_2O_4.2H_2O$, $CaCO_3$, $(COOH)_2.2H_2O$ Differential thermal analysis-principle, instrumentation, difference between TG and DTA-applications with special reference to the clays and minerals, coals (fuels). Differential scanning calorimetry-principle, instrumentation, applications to inorganic materials like chlorates and per chlorates, ammonium nitrate, organic compounds and Drugs **.Radio chemical methods of analysis:** detection and measurement of radioactivity, introduction to radioactive tracers, applications of tracer technique, isotope dilution analysis-applications, activation analysis – application, advantages and disadvantages, radio carbon dating technique

List of Experiments:

Voltammetry: 1.Fabrication of carbon paste electrode.2.Determination of peak potential of Pb, Cd and Zn using differential pulse voltammetry at carbon paste electrode.3.Determination of amount Pb present in unknown sample using square wave voltammetry.4.Determination of

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amount Cd present in unknown sample using square wave voltammetry.5.Determination of amount Zn present in unknown sample using square wave voltammetry.**Spectrophotometry:**1.Spectrophotometric determination of Fe (III) using KSCN.2.Spectrophotometric determination of phosphate.3.Spectrophotometric determination of Cr (VI).4.Spectrophotometric determination of Nitrite.5.Determination of pKa value of an indicator by spectrophotometry. **pH-metry:** Determination of dissociation constant (pKa) of acetic acid using pH-metry.2. Determination of dissociation constant (pKa) of acetic acid using point wise calculation.3.Determination of carbonate and bicarbonate in the given mixture by pH-metry.4.Determination of isoelectric point of amino acids.5.Determination of ionization constant of amino acids using Irving Rosotti method. **Conductometry:** Determination of halides (Cl^-, I^- etc.) using conductometric method.2.Determination of the degree of ionization and ionization constant of weak electrolytes.3.Determination of solubility of sparingly soluble salts by conductometric method.4.Estimation of Aspirin by conductometry. **Chromatography:** Separation of amino acids by TLC. 2. Determination of aspirin by HPLC.3.Separation of pigments by paper chromatography.4.Separation of cations and their quantification by ion exchange chromatography. **Flame photometry:** Determination of Na, K and Li by Flame photometry.

1/10/2019

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19CY5402-ADVANCED APPLIED ANALYSIS

L-T-P-S : 4-0-6-0

Credits : 7

Contact Hours : 10

Syllabus:

Analysis of raw materials: Analysis of non-ferrous alloys: Brass – Analysis of the constituents – Cu, Zn, Sn, Pb and Fe. Bronze -Analysis of the constituents -Cu, Sn, Zn, Pb and Fe. Solder - Analysis of the constituents – Sn, Pb and Sb. Analysis of Ferro alloys : Ferro silicon - Analysis of the constituents – Si, C, P,S Ferro vanadium - Analysis of the constituents – V, C, P, S. Si, Al. Ferro manganese - Analysis of the constituents – Mn, S, C, P, Si Silico manganese -Analysis of the constituents –Mn, S, C, P, Si Ferro chromium - Analysis of the constituents – Cr, C, Si.**Analysis of Soil, Fertilizer and Fuel:** Analysis of soils: sampling, determination of moisture, total N, P, Si, lime, humus nitrogen, alkali salts, soil absorption ratio. Analysis of fertilizers: ammonical fertilizers, Phosphate fertilizers, Nitrate fertilizers. Analysis of fuels: solid fuels-coal, proximate analysis, ultimate analysis, heating value, grading of coal based on Ultimate Heat Value (UHV).**ASSESSMENT OF AIR QUALITY:** Composition of Pure Air, Classification of Air Pollutants, Toxic Elements Present in Dust and their Sources – Collection of Air Samples. Sources, Effects, Control of Pollution and Chemical Analysis for the following. Primary Pollutants:Carbon compounds - Carbon monoxide(CO) and Carbon dioxide(CO_2). Sulphur compounds- sulphur dioxide (SO_2), Sulphur trioxide (SO_3) and Hydrogen Sulphide (H_2S). Nitrogen compounds - nitric oxide (NO), and nitrogen dioxide (NO_2), Hydrocarbons - Aliphatic hydrocarbons and polycyclic aromatic hydrocarbons (PAH). Particulate matter - Repairable and Suspended particulate matter, Inorganic and Organic particulates. Secondary pollutants - ozone (O_3), peroxy acetyl nitrate (PAN), peroxy benzyl nitrate (PBN), Standards for ambient air quality. **Kinetic Methods of Analysis & Non aqueous Titrimetry:** Kinetic methods of analysis: introduction, slow reactions, catalyzed reactions, methods of determination of catalyst concentration, extrapolation method for the determination of catalyst, variable time method, fixed time method, examples for the determination of toxic metals and anions using some typical kinetic reactions.**Non aqueous titrimetry:** Classification of solvents and titrations for non aqueous titrimetry- Types of reactions – Indicators. Determination of acids Determination of bases Karl-Fisher reagent for the determination of moisture content in drugs and other samples.

List of Experiments:

Complexometric titrations: (i) Analysis of zinc in zinc ore by using EDTA (ii)Analysis of nickel by EDTA. (iii).Analysis of limestone or dolomite.**Analysis of oils, fats and soaps.(i)**Analysis of oil for the determination of saponification value, acid value and iodine value.(ii)Analysis of soaps for moisture content and total alkali.**Analysis of coal: (i)** moisture content (ii)volatile matter. (iii) fixed carbon ash content

10-2019

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AAA-Course wise Syllabus revision of approved structure as mentioned in point 2

Course Code	Course Name	Course Category	Existing Syllabus	New Syllabus	Topics Added/Removed/Replaced	Change in Outcome	Justification for the Modification	Revision Percentage
19CY 5313	PHOTOCHEMISTRY AND PERICYCLIC REACTIONS	Prof. elective	Advanced organic named reactions with mechanisms: Baylis- Hillman reaction, Mitsunobu reaction, Pechmann condensation, Roush coupling, Shapiro reaction, Suzuki coupling.Fundamental concepts, Jablonski diagram, Energy transfer and characteristics of photo reactions. Photo reduction and photo oxidation, photo reactions of ketones and enones, Norrish Type I and II reactions. Photochemistry of alkenes, dienes and aromatic compounds, reactions of un-activated centres–Photolytic cycloadditions and photolytic rearrangements –Photosenstitisation –Photoadditions – Barton reaction – Parterno Buchi reaction.Concerted reactions – stereochemistry-orbital symmetry and concerted symmetry and correlation diagram – Frontier molecular orbital approach, Woodward and Hoffmann rules – Electrocyclic reactions – cycloaddition reactions. Sigmatropic rearrangements – selection rules and examples with simple molecules – 1,3 and 1,5 hydrogen shifts –Cope and Claisen rearrangements. 1.Estimation of Hydroxyl group by acetylation or phthalation .method.2.Estimation of phenol by bromination method.3.Estimation of aniline by Bromination method 4.Estimation of Carbonyl Groups by Hydrogen formation method.5.Estimation of sugars by using Fehling's method.6.Estimation of Vitamin-C in lime Juice.7.Isolation of Caffeine from tea.8.Isolation of Lycopene from Tomatoes.9.Isolation of Lactose from Milk.10.Isolation of Citric Acid from Lemon	Advanced organic named reactions with mechanisms: Baylis- Hillman reaction, Mitsunobu reaction, Pechmann condensation, Roush coupling, Shapiro reaction, Suzuki coupling.Fundamental concepts, Jablonski diagram, Energy transfer and characteristics of photo reactions. Photo reduction and photo oxidation, photo reactions of ketones and enones, Norrish Type I and II reactions. Photochemistry of alkenes, dienes and aromatic compounds, reactions of un-activated centres–Photolytic cycloadditions and photolytic rearrangements –Photosenstitisation –Photoadditions – Barton reaction – Parterno Buchi reaction. Concerted reactions – stereochemistry-orbital symmetry and concerted symmetry and correlation diagram –Frontier molecular orbital approach, Woodward and Hoffmann rules – Electrocyclic reactions – cycloaddition reactions. Sigmatropic rearrangements – selection rules and examples with simple molecules – 1,3 and 1,5 hydrogen shifts –Cope and Claisen rearrangements.	Sigmatropic rearrangements – selection rules and examples with simple molecules – 1,3 and 1,5 hydrogen shifts – Cope and Claisen rearrangements.	CO-5	Academic Peers suggested.	20%
19CY 5311	Natural Products and Bioorganic	Prof. Core	Structure, isolation, stereochemistry and synthesis of the following class of natural products from plant, animal and microbial sources: Acetogenins and shikimates: Microbial metabolites: Pencillin G,	Structure, isolation, stereochemistry and synthesis of the following class of natural products from plant, animal and microbial sources: Acetogenins and shikimates: Microbial metabolites: Pencillin G, Cephalosphorin-Ö and streptomycin. Terpenoids: Forskolin, taxol and azadirachtin. Biogenesis and biological properties of the Pencillin G, Cephalosphorin-Ö	Synthesis of peptides by Merrifield solid phase	CO-5	Academic Peers & Industry Experts	20%

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	ules		Cephalosphorin-Ö and streptomycin. Terpenoids: Forskolin, taxol and azadirachtin. Biogenesis and biological properties of the Pencillin G, Cephalosphorin-Ö and streptomycin, Terpenoids: Forskolin, taxol and azadirachtin. Structure, isolation, stereochemistry and synthesis of the following class of natural products from plant, animal and microbial sources: Alkaloids: Morphine, reserpine and vincristine Biopolymers: Peptides: α-Aminoacids. Synthesis of peptides by Merrifield solid phase synthesis. Chemistry of oxytocin and dolastain-10.	and streptomycin, Terpenoids: Forskolin, taxol and azadirachtin. Structure, isolation, stereochemistry and synthesis of the following class of natural products from plant, animal and microbial sources: Alkaloids: Morphine, reserpine and vincristine Biopolymers: Peptides: α-Aminoacids. Synthesis of peptides by Merrifield solid phase synthesis. Chemistry of oxytocin and dolastain-10. **1.Estimation of Hydroxyl group by acetylation or phthalation method.2.Estimation of phenol by bromination method.3.Estimation of aniline by Bromination method.4.Estimation of Carbonyl Groups by Hydrogen formation method.5.Estimation of sugars by using Fehling's method.6.Estimation of Vitamin-C in lime Juice.7.Isolation of Caffeine from tea.8.Isolation of Lycopene from Tomatoes.9.Isolation of Lactose from Milk.10.Isolation of Citric Acid from Lemon**	synthesis. Chemistry of oxytocin and dolastain-10.		Suggested-Covers the Industrial Concepts which helps the students for attaining better employment	
19CY 5408	Advanced Heterocyclic Chemistry	Prof. Core	Introduction to Heterocycles:Nomenclature (Hantzsch Widman System), spectral characteristics, reactivity and aromaticity of monocyclic, fused and bridged heterocycles. Nonaromatic heterocycles:Different types of strains, interactions and conformational aspects on nonaromatic heterocycles. Synthesis, reactivity, and importance of the following ring systems.Azirines, Oxaranes, Thiiranes, Diazirenes, Diaziridines, Azetidines.Five and six-membered heterocycles with two hetero atoms:Synthesis, reactivity, aromatic character and importance of the following heterocycles: Pyrazole, Imidazole, Oxazole, Thiazole, Pyrimidine, Pyrazine, Oxazine,and Thiazine. Heterocycles with more than two hetero atoms: Synthesis, reactivity, aromatic character and importance of the following heterocycles: Triazoles, Oxadiazoles, Thiadiazoles, Triazines.Larger ring and other heterocycles:Synthesis and reactivity of Azepines, Oxepines and Thiepines. Synthesis and rearrangement of Diazepines. Synthesis of Benzoazepines, Benzodiazepines,Benzooxepines, Benzothiepines, Azocines, and Azonines.Banzanellated azoles and dipolar structures:Banzanellated azoles: Synthesis and reactivity of Benzimidazoles, Benzoxazoles and Benzothiazoles. Heterocyles with Ring-	Nomenclature (Hantzsch Widman System), spectral characteristics, reactivity and aromaticity of monocyclic, fused and bridged heterocycles. Nonaromatic heterocycles. Different types of strains, interactions and conformational aspects on nonaromatic heterocycles. Synthesis, reactivity and importance of the following ring systems. Azirines, Oxaranes, Thiiranes, Diazirenes, Diaziridines, Azetidines. Five and six-membered heterocycles with two hetero atoms: Synthesis, reactivity, aromatic character and importance of the following heterocycles: Pyrazole, Imidazole, Oxazole, Thiazole, Pyrimidine, Pyrazine, Oxazine, and Thiazine.Heterocycles with more than two hetero atoms: Synthesis, reactivity, aromatic character and importance of the following heterocycles: Triazoles, Oxadiazoles, Thiadiazoles, Triazines. Larger ring and other heterocycles: Synthesis and reactivity of Azepines, Oxepines and Thiepines.Synthesis and rearrangement of Diazepines. Synthesis of Benzoazepines, Benzodiazepines, Benzooxepines, Benzothiepines, Azocines, and Azonines. Banzanellated azoles and dipolar structures: Banzanellated azoles: Synthesis and reactivity of Benzimidazoles, Benzoxazoles and Benzothiazoles. Heterocyles with Ring-Junction nitrogen: Synthesis and reactivity of Quinolizines, Indolizines and Imidazopyridines. Heterocycles with dipolar structures.Betaines: Formation, aromaticity and reactivity of pyridine-N-oxides and pyridinium imides. Mesoionic heterocycles: Synthesis and aromaticity of sydnones and 1,3- dipolar addition reaction of mesoionic heterocycles. **1.Synthesis of Thiepine 2.Synthesis of benzophenone 3.Synthesis of diazotized compounds (Triazoles) 4.Synthesis of1,2,4- Triazole 5.Synthesis of Isoxazole 6.Synthesis of Ergotamine (Indole based alkaloid) 7.Synthesis of Cinchonine 8.Synthesis of Quinine 9.Synthesis of Prima Quinine.10.Synthesis of Acetazolamide**	Heterocyles with Ring-Junction nitrogen: Synthesis and reactivity of Quinolizines, Indolizines and Imidazopyridines. Heterocycles with dipolar structures.Betaines: Formation, aromaticity and reactivity of pyridine-N-oxides and pyridinium imides.	CO-5	Industry Peers Suggested to make it as core subject based on the importance in the industry.	20%

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			Junction nitrogen: Synthesis and reactivity of Quinolizines, Indolizines and Imidazopyridines. Heterocycles with Dipolar structures:Betaines: Formation, aromaticity and reactivity of pyridine-N-oxides and pyridinium imides. Mesoionic heterocycles: Synthesis and aromaticity of sydnones and 1,3-dipolar addition reaction of mesoionic heterocycles.					
19CY 5308	Surface Analytical Techniques	Prof. Elective	Electron Spectroscopy for Chemical Analysis (ESCA): Principles, Instrumentation, and Analytical Applications. Auger electron spectroscopy: Principles, Instrumentation, Applications. Secondary ion mass spectrometry (SIMS): Principles, Instrumentation, Applications. Thin solid films, Langmuir-Blodgett Monolayers, SERRS, Mapping and imaging, Applications.Electron Energy Loss Spectroscopy (EELS): Principles, Instrumentation, Applications. Electron Microprobe analysis: Principles, Instrumentation, Analysis of semiconductors and crystalline materials, Applications.Low Energy Ion Scattering Spectroscopy: Principle, Instrumentation, Surface structural analysis	Electron Spectroscopy for Chemical Analysis (ESCA): Principles, Instrumentation, and Analytical Applications. Auger electron spectroscopy: Principles, Instrumentation, Applications. Secondary ion mass spectrometry (SIMS): Principles, Instrumentation, Applications.**Surface enhanced Raman Spectroscopy (SERS): Principles, Instrumentation, Nanoparticulate SERS substrates, Surface enhanced resonance Raman scattering (SERRS), SERRS of Ag and Au metal colloids**, Thin solid films, Langmuir-Blodgett Monolayers, SERRS, Mapping and imaging, Applications.Electron Energy Loss Spectroscopy (EELS): Principles, Instrumentation, Applications. Electron Microprobe analysis: Principles, Instrumentation, Analysis of semiconductors and crystalline materials, Applications. Low Energy Ion Scattering Spectroscopy: Principle, Instrumentation, Surface structural analysis	Applications. Low Energy Ion Scattering Spectroscopy: Principle, Instrumentation, Surface structural analysis	CO-2	Academic Peers suggested to included the topics to increase the importance of this course.	20%
19CY 5305	Applications Of Chemical Spectroscopy	Prof. Elective	Infrared Spectroscopy: Fourier Transform infrared spectroscopy: Applications. Ultraviolet and visible spectroscopy: Applications of UV-Visible spectroscopy, Nuclear Magnetic Resonance Spectroscopy:Carbon-13 NMR spectroscopy; COSY, NOE, FT NMR, 2D NMR and CIDNP. Mass Spectrometry: Fragmentation: McLafferty rearrangement. Particle bombardment methods, PD, SIMS, FAB, Gas chromatography-mass spectrometry, MS data system. Combined Applications: UV, IR, NMR and Mass in the elucidation of molecular structure.	Infrared Spectroscopy: Fourier Transform infrared spectroscopy: Applications. Ultraviolet and visible spectroscopy: Applications of UV-Visible spectroscopy, Nuclear Magnetic Resonance Spectroscopy: **Applications of AB, AX, ABC, AMX Systems; double resonance, Lanthanide shift reagents;** Carbon-13 NMR spectroscopy; COSY, NOE, FT NMR, 2D NMR and CIDNP. Mass Spectrometry: Fragmentation: McLafferty rearrangement. Particle bombardment methods, PD, SIMS, FAB, Gas chromatography-mass spectrometry, MS data system. Combined Applications: UV, IR, NMR and Mass in the elucidation of molecular structure.	bombardment methods, PD, SIMS, FAB, Gas chromatography-mass spectrometry, MS data system	CO-3	Academic Peers suggested to included the application topics to increase the importance of this course.	20%

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02-05-2019

DEPARTMENT OF CHEMISTRY

Department Academic Committee (DAC)

Minutes of Meeting, A.Y. 2019-20

The 4th DAC meeting was conducted in HOD chemistry chamber on 2nd May, 2019 at 2.00 PM.

Agenda: To Modify the M. Sc Chemistry Programme Curriculum

The following members were present:

1	Dr.J.V.Shanmukha Kumar	Head of the Department
2	Dr.K.R.S.Prasad	Professor & Associate Dean Student Affairs
3	Dr.S.Nareshvarma	Assistant Professor & PG Coordinator
4	Dr.Pradeep Kumar Brahman	Assistant Professor & RPAC Chairman
5	Dr.A.Venkateswara rao	Assistant Professor & Professor in Charge
6	Mr.Hari Krishna Kuntia	2nd year M.Sc Student
7.	Mr.T.Trinath	2nd year M.Sc Student

The following points were discussed and resolved:

1. In order to meet the industrial requirements, the priority of the courses to be modified.
2. In Semester-3: Separation Techniques-I (18CY2111) (L-T-P: 4-0-6) course which was earlier floated as a professional core has been made as an elective course for which course code has been changed as 18CY2114 along with L-T-P structure (L-T-P-S: 3-0-0-0).
3. . In Semester-3: Instrumental Methods of Analysis (18CY2114)) (L-T-P: 3-0-0) course which was earlier floated as a dept., elective has been made as Professional core for which Course Title and code along with L-T-P-S has been modified as Instrumental Methods of Analysis-I and 18CY2111 (L-T-P: 4-0-6-0).
4. In Semester-4: Separation Techniques-II (18CY2211) (L-T-P: 4-0-6) course which was earlier floated as a professional core has been made as an elective course for which course code has been changed as 18CY2214 along with L-T-P structure (L T P-S: 3-0-0-0).

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5. In Semester-4: Advanced Instrumental Methods of Analysis (18CY2215) (L-T-P: 3-0-0) course which was earlier floated as a dept., elective has been made as Professional core for which Course Title and code along with L-T-P-S has been modified as Instrumental Methods of Analysis-II and 18CY2211 (L-T-P: 4-0-6-0).
6. In Semester-4: Advanced Applied Analysis (18CY2214) (L-T-P:3-0-0) course which was earlier floated as a dept., elective has been made as Professional core for which Course code along with L-T-P-S has been modified as 18CY2212 (L-T-P: 4-0-6-0).
7. The Laboratory component also framed for Instrumental methods of analysis-I (18CY2111), Instrumental methods of analysis-II (18CY2211) and Advanced Applied Analysis (18CY2212).

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Therefore, the minutes of the 4th Department Academic Committee meeting held on 2nd May, 2019 at 2:00 PM were confirmed by the members

S. No.	Name of the Member	Designation	Signature
1	Dr. J. V. Shanmukha Kumar	Head of the Department	
2	Dr.K.R.S.Prasad	Professor & Associate Dean Student Affairs	
3	Dr.S.Nareshvarma	Assistant Professor & PG Co-Ordinator	
4	Dr.Pradeep Kumar Brahman	Assistant Professor & RPAC Chairman	
5	Dr.A.Venkateswara rao	Assistant Professor & Professor in Charge	
6.	Mr. Hari Shankar Kuntia	2nd year M.Sc Student	
7.	T.Trinath	2nd year M.Sc Student	

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Head of the Department

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