



## Koneru Lakshmaiah Education Foundation

(Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

Accredited by NAAC as 'A' Grade University Approved by AICTE ISO 9001-2015 Certified

Campus: Green Fields, Vaddeswaram - 522 502, Guntur District, Andhra Pradesh, INDIA

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### XXIV Academic Council - Annexure 4

23-06-2018

### DEPARTMENT OF CHEMISTRY MINUTES OF 2<sup>nd</sup> BOARD OF STUDIES MEETING

The department of chemistry had conducted 2<sup>nd</sup> BOS meeting on 23-06-2018 in F 008 from 10:00 AM to 1:00 PM.

#### The following members were present:

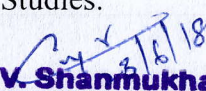
1. Dr J V Shanmukha Kumar, Professor, HOD- Chairperson
2. Dr K R S Prasad, Professor, Internal Member
3. Dr Y Anjaneyulu, Professor, Internal Member
4. Dr K Ravindranath, Professor, Internal Member
5. Dr N S Kameswara Rao, Professor, Internal Member
6. Dr M Sujatha, Associate Professor, Internal Member
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.

#### Members Absent:

1. Dr Pranvir S Satavat, Professor & Dean Academics, KLEF, Special Invitee

Dr. J. V. Shanmukha Kumar, the Chairman of the Board of Studies, initiated the meeting by extending a warm welcome 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.

  
**Dr. J.V. Shanmukha Kumar**  
Head of the Department  
Department of Chemistry  
Koneru Lakshmaiah Education Foundation  
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Green Fields, Vaddeswaram-522 302,  
Guntur Dist., A.P., India.



## AGENDA and RESOLUTIONS

### Agenda Item 1:

Addition of new courses as professional electives in the curriculum for the 2018 admitted batch of the M.Sc. Chemistry program.	Recommended for approval in academic council.
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### Discussion:

Taking into account the input from stakeholders (Dr. K. Ravindranath, Dr. K R S Prasad, Dr. J V Shanmukha Kumar, Dr. K. Ravindranath, Dr. B Pradeep Kumar from KLEF; Dr. M V Basaveswara Rao from Krishna University; Dr. A. Ramachandraiah from NIT Warangal; 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 2018 to all members. Following thorough discussions, the BOS members proposed certain revisions to the curriculum by introducing new courses as professional electives and recommended its adoption by the academic council.

### Resolution:

It was resolved and recommended for approval in academic council to introduce new courses as Professional electives into 2018 Curriculum.

- To impart proficiency in operating and interpreting data from advanced analytical instruments, enhancing technical expertise, problem-solving abilities, and data analysis skills essential for precision and accuracy in scientific research and industrial applications the following courses are introduced:

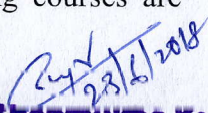
18CY2114-Instrumental Methods of Analysis  
18CY2104- Techniques for modern industrial applications  
18CY2214- Advanced Applied Analysis  
18CY2215- Advanced Instrumental Methods of Analysis  
18CY2216- Classical Methods of Analysis

- To equip students with expertise in utilizing spectroscopic techniques, fostering data interpretation, analytical, and scientific communication skills essential for diverse research and industrial contexts the following courses are introduced:

18CY2115- Applications of Chemical Spectroscopy  
18CY2204- Advanced Organic spectroscopy

- To impart expertise in the analysis of biomolecules, enhancing laboratory techniques, and interdisciplinary collaboration skills crucial for applications in medical diagnostics, pharmaceutical research, and biotechnology the following courses are introduced:

18CY2116- Bio analytical Chemistry  
18CY2117- Environmental Chemistry

  
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18CY2118- Surface Analytical Techniques

18CY2119- Analysis of Food and Drugs

- To equip students with specialized knowledge in heterocyclic compounds, fostering expertise in synthetic methods, drug design, and complex problem-solving skills for applications in pharmaceuticals, materials science, and advanced chemical research the following courses are introduced:

18CY2105- Advanced Heterocyclic chemistry

18CY2106- Bio Organic Chemistry

18CY2107- Green Chemistry

18CY2108- Food Chemistry

18CY2206- Organometallic Chemistry.

- To provide a comprehensive understanding of natural compounds and their biological significance, fostering analytical, research, and interdisciplinary collaboration skills essential for applications in pharmaceuticals, biotechnology, and scientific research the following courses are introduced:

18CY2109- Medicinal chemistry

18CY2205- Natural products and Biomolecules

18CY2110- Nano Chemistry

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

**Agenda Item 2:**

Resolution and Recommendation of DAC Meeting Minutes (Dated 25-05-2018)	Recommended for approval in academic council.
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**Discussion:**

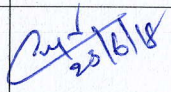

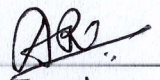
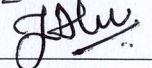
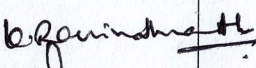
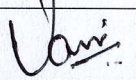
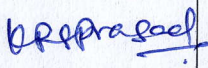


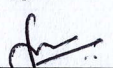


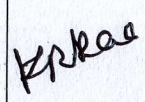
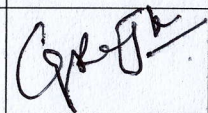
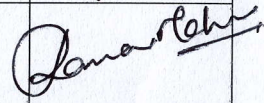
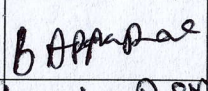
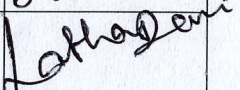
The Departmental Academic Committee (DAC) deliberated and decided to commence dissertation work in the 3rd semester instead of the 4th semester. This change aims to facilitate academic publications that may enhance opportunities for placements or further studies.

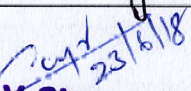
**Resolution:**

The minutes of the Departmental Academic Committee (DAC) meeting held on May 25, 2018, were reviewed, endorsed, and recommended for approval in academic council.

*Dr. J.V. Shanmukha Kumar*  
23/5/18  
**Dr. J.V. Shanmukha Kumar**  
Head of the Department  
Department of Chemistry  
Koneru Lakshmaiah Education Foundation  
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Green Fields, Vaddeswaram-522 302,  
Guntur Dist., A.P., India.



S.NO	FULL NAME	DESIGNATION	ORGANIZATION	POSITION IN THE MEETING	SIGNATURE
1	Dr. J. V. Shanmukha Kumar	BOS Chair	KLEF, Vaddeswaram	BOS CHAIR	
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.Nareshvarma	Member	KLEF, Vaddeswaram	Member	
11	Dr. A. Venkateswara Rao	Member	KLEF, Vaddeswaram	Member	
12	Dr. Pradeep Kumar Brahmin	Member	KLEF, Vaddeswaram	Member	
13	Dr. Pranvir S Satvat 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. N S M P Latha Devi, Physics	Special Invitee	KLEF, Vaddeswaram	Special Invitee	

  
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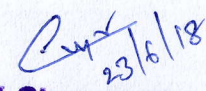
## Program Structure

S. No	Course Code	Course Name	Category	L	T	P	S	Cr
1	18CY1101	General Chemistry-I	Prof. Core	4	0	0	0	4
2	18CY1102	Inorganic Chemistry- I	Prof. Core	4	0	6	0	7
3	18CY1103	Organic Chemistry-I	Prof. Core	4	0	6	0	7
4	18CY1104	Physical Chemistry-I	Prof. Core	4	0	6	0	7
5	18CY1201	General Chemistry-II	Prof. Core	4	0	0	0	4
6	18CY1202	Inorganic Chemistry- II	Prof. Core	4	0	6	0	7
7	18CY1203	Organic Chemistry-II	Prof. Core	4	0	6	0	7
8	18CY1204	Physical Chemistry-II	Prof. Core	4	0	6	0	7
9	18CY2111	Separation Techniques -I	Prof. Core	4	0	6	0	7
10	18CY2112	Quality Control and Traditional Methods of Analysis-I	Prof. Core	4	0	6	0	7
11	18CY2113	Applied Analysis	Prof. Core	4	0	0	0	4
12	18CY2101	Photo Chemistry and pericyclic reactions	Prof. Core	4	0	0	0	4
13	18CY2102	Organic Synthesis-I	Prof. Core	4	0	6	0	7
14	18CY2103	Organic Spectroscopy	Prof. Core	4	0	6	0	7
15	18CY2211	Separation Methods – II	Prof. Core	4	0	6	0	7
16	18CY2212	Traditional Methods of Analysis - II	Prof. Core	4	0	6	0	7
17	18CY2213	Dissertation with Research Publication	SKill	0	0	12	0	6
18	18CY2201	Organic Reaction Mechanisms and Named Reactions	Prof. Core	4	0	6	0	7
19	18CY2202	Organic Synthesis-2	Prof. Core	4	0	6	0	7
20	18CY2203	Dissertation with Research Publication	SKill	0	0	12	0	6
21	18CY2114	Instrumental Methods of Analysis	Prof. Electives	3	0	0	0	3
22	18CY2115	Applications of Chemical Spectroscopy	Prof. Electives	3	0	0	0	3
23	18CY2116	Bio analytical Chemistry	Prof. Electives	3	0	0	0	3
24	18CY2117	Environmental Chemistry	Prof. Electives	3	0	0	0	3
25	18CY2118	Surface Analytical Techniques	Prof. Electives	3	0	0	0	3

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26	18CY2119	Analysis of Food and Drugs	Prof. Electives	3	0	0	0	3
27	18CY2104	Techniques for modern industrial applications	Prof. Electives	3	0	0	0	3
28	18CY2105	Advanced Heterocyclic chemistry	Prof. Electives	3	0	0	0	3
29	18CY2106	Bio Organic Chemistry	Prof. Electives	3	0	0	0	3
30	18CY2107	Green Chemistry	Prof. Electives	3	0	0	0	3
31	18CY2108	Food Chemistry	Prof. Electives	3	0	0	0	3
32	18CY2109	Medicinal chemistry	Prof. Electives	3	0	0	0	3
33	18CY2214	Advanced Applied Analysis	Prof. Electives	3	0	0	0	3
34	18CY2215	Advanced Instrumental Methods of Analysis	Prof. Electives	3	0	0	0	3
35	18CY2216	Classical Methods of Analysis	Prof. Electives	3	0	0	0	3
36	18CY2204	Advanced Organic Spectroscopy	Prof. Electives	3	0	0	0	3
37	18CY2205	Natural Products and Biomolecules	Prof. Electives	3	0	0	0	3
38	18CY2206	Organometallic Chemistry	Prof. Electives	3	0	0	0	3
39	18CY2110	Nano Chemistry	Prof. Electives	3	0	0	0	3

  
 23/6/18  
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## Annexure-I

Addition of new courses as professional electives in the curriculum for the 2018 admitted batch of the M.Sc. Chemistry program.

Course Code: 18CY2114

Course Name: Instrumental Methods of Analysis

L-T-P-S: 3-0-0-0

Credits: 3

Prerequisite: NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Understand the basic concepts of UV-Visible Spectroscopy.	1,2,3	3
CO2	Demonstrate the instrumentations and applications of Spectrofluorimetry and chemiluminescence.	1,2	3
CO3	Apply the basic principles of IR and Mass spectroscopy in analytical applications.	1,2	3
CO4	Understand the basic principles of X-ray spectroscopy and surface characterization techniques.	1	3

**Syllabus:** (a) 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<sup>2+</sup>, Fe<sup>3+</sup>, Al<sup>3+</sup>, NH<sub>4</sub><sup>+</sup>, Cr<sup>3+</sup>, Cr<sup>6+</sup>, Co<sup>3+</sup>, Cu<sup>2+</sup>, Ni<sup>2+</sup> and anions – NO<sub>2</sub><sup>-</sup>, PO<sub>4</sub><sup>3-</sup> using suitable reagents, simultaneous determinations of dichromate and permanganate in a mixture, spectrophotometric titrations, principle of diode array spectrophotometers.

(b) Spectrofluorimetry: Theory of fluorescence, phosphorescence, factors affecting the above, quenching, relation between intensity of fluorescence and concentration, instrumentation, application with reference to Al<sup>3+</sup>, chromium salts, fluorescence, thiamin (B1) and riboflavin (B2) in drug samples

Spectroscopic Methods - 2

(a) 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<sub>2</sub>, non-destructive IR method for the analysis of CO and other organic compounds, principles of Fourier transform IR.

(b) Raman Spectroscopy: Raman effect and spectra, differences between Raman spectra and IR spectra, instrumentation, Raman spectra of CO, CO<sub>2</sub>, N<sub>2</sub>O, H<sub>2</sub>O.

Spectroscopic Methods -3

(a) NMR Spectroscopy: resonance condition, origin of NMR spectra, instrumentation, chemical shift, factors affecting chemical shift, shielding, spin-spin splitting, mechanism for spin-spin coupling, interpretation of NMR spectra of typical organic compounds, factors influencing NMR spectra, fast chemical reactions, magnitude of I, nuclei with quadrupole

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moments, FT NMR, study of isotopes other than proton-<sup>13</sup>C, <sup>15</sup>N, <sup>19</sup>F, <sup>31</sup>P, <sup>11</sup>B, double resonance, spin tickling, shift reagents, applications.

(b) ESR Spectroscopy: principle, g value, hyper fine splitting, qualitative analysis, Krammers degeneracy, fine splitting, instrumentation, introduction to double resonance technique, difference between ESR and NMR spectra, quantitative analysis, application to study of free radicals and other analytical applications.

Spectroscopic Methods -4

(a) Mass Spectroscopy: Principle, basic instrumentation, energetics of ion formation, types of peaks observed, resolution, qualitative analysis, molecular weight determination, quantitative analysis, advantages

(b) X-ray Spectroscopy (XRF): chemical analysis by X-ray spectrometers, energy dispersive and wavelength dispersive techniques, evaluation methods, instrumentation, matrix effects, applications.

List of Experiments:

1. Determination of alkalinity in a colored effluent using pH metric end point
2. Determination of purity of commercial HCl, H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub> and CH<sub>3</sub>COOH 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<sub>3</sub> using potentiometric end point
7. Determination of KSCN with AgNO<sub>3</sub> 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 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)

#### TEXTBOOKS:

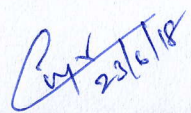
- 1) Instrumental methods of analysis by H.H Willard, Meritt Jr. and J.A Dean
- 2) Principles of instrumental analysis by Skoog and West
- 3) Vogels Textbook of Quantitative Inorganic analysis by J. Basset, R.C Denney, G.H Jefferey and J.Madhan
- 4) Instrumental methods of analysis by B.K Sarma, Goel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

*Ch S*  
*22/6/18*  
**Dr. J.V. Shanmukha Kumar**  
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## REFERENCE BOOKS:

- 1) Introduction to instrumental analysis by R. D. Braun, Mc Graw Hill - International edition.
- 2) Analytical spectroscopy by Kamalesh Bansal, 1<sup>st</sup> edition.
- 3) Instrumental methods of chemical analysis by Willard, Dean and Merittee- 6<sup>th</sup> edition.
- 4) Analytical chemistry principles by John H. Kenedey- 2<sup>nd</sup> 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.

  
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Course Code: 18CY2115

Course Name: Applications of Chemical Spectroscopy

L-T-P-S: 3-0-0

Credits: 3

Prerequisite: NIL

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

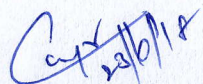
**Syllabus:** Infrared Spectroscopy: Fourier Transform infrared spectroscopy: Applications. Ultraviolet and visible spectroscopy: Applications of UV-Visible spectroscopy, Nuclear Magnetic Resonance Spectroscopy: Applications of AB, AX, ABC, AMX Systems; double resonance, Lanthanide shift reagents; Carbon-13 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, 5<sup>th</sup> Edition, S. Chand Publishers, 2007.

**REFERENCE BOOKS:**

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

  
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**Course Code:** 18CY2116

**Course Name:** Bio analytical Chemistry

**L-T-P-S:** 3-0-0-0

**Credits:** 3

**Prerequisite:** NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Understand the basic principles of bioanalysis	1	3
CO2	Explain the basic concept of Radiochemical Manometric and Calorimetric.	2	3
CO3	Apply electrophoretic method in bioassay	1	3
CO4	Explain and apply biosensors in biomolecule analysis	1	3

**Syllabus:** Relevance of Bio- Assaying and Biochemical Analysis; Spectroscopic methods and fluorometric methods; Quantitation of Enzymes and Optical Methods of Detection of Enzymes; Electroanalytical Methods of Enzyme Detection; Radiochemical, Manometric, Calorimetric and Other Miscellaneous Methods; Immobilization Methods; Methods; Mass Spectrometry of Biomolecules, Matrix-assisted laser desorption/ionization (MALDI); Chromatography of macromolecular biomolecules; Mass Transfer Methods; Centrifugation and Sedimentation Methods; Electrophoretic Methods; Electrochemical Sensors and BioSensors in Bioanalysis; Immunoassaying;

**TEXTBOOKS:**

- 1) Bio Analytical Chemistry by Susan R. Mikkelsen and Eduardo Cortón, John Wiley & Sons Inc, 2004
- 2) Bio Analytical Chemistry by Andreas Manz and Nicole Pamme, Imperial College Press, 2012

**REFERENCE BOOKS:**

- 1) Bio Analytical Chemistry by Susan R. Mikkelsen and Eduardo Cortón, John Wiley & Sons Inc, 2004
- 2) Bio Analytical Chemistry by Andreas Manz and Nicole Pamme, Imperial College Press, 2012

*J.V. Shanmukha Kumar*  
25/12/18

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**Course Code:** 18CY2117

**Course Name:** Environmental Chemistry

**L-T-P-S:** 3-0-0-0

**Credits:** 3

**Prerequisite:** NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Understand greenhouse effect concept	1	3
CO2	Employ various sampling techniques for air sampling	2	3
CO3	Understand various pollution monitoring techniques	5	3
CO4	Explain environmental Impact Assessment process	2	3

**Syllabus:**

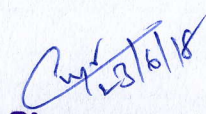
Chemistry of Atmosphere: Composition and structure of atmosphere, Greenhouse effect, Ozone depletion, Photochemical smog, Air sampling techniques, Sources, effects and monitoring of air pollutants by Instrumental methods, Control of air pollution, Water Pollution, Different types of water pollutants, Sources, characteristics and effects of water pollutants, Monitoring of Water Pollutants, Treatment of Municipal Waste Water, Treatment of Industrial Waste Water, Environmental Impact Assessment process in India, Basic principles of Green Chemistry.

**TEXTBOOKS:**

- 1) Fundamental Concepts of Environmental Chemistry by G.S. Sodhi, 2<sup>nd</sup> Edition, Narosa publishing House, 2005
- 2) New Trends in Green Chemistry by V.K. Ahluwalia, M. Kidwai, Anamaya publishers, 2004.
- 3) Wastewater Treatment by M.N. Rao and A.K. Datta, 2<sup>nd</sup> Edition, Oxford Publications, 2007.

**REFERENCE BOOKS:**

- 1) Fundamental Concepts of Environmental Chemistry by G.S. Sodhi, 2<sup>nd</sup> Edition, Narosa publishing House, 2005
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Course Code: 18CY2118

Course Name: Surface Analytical Techniques

L-T-P-S: 3-0-0-0

Credits: 3

Prerequisite: NIL

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

### Syllabus:


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), 2<sup>nd</sup> Edition, Springer, 2010.
- 2) Surface Analysis: The Principal Techniques by John C Vikerman, Ian Gilmore (Eds.), 2<sup>nd</sup> Edition, Wiley, 2009.
- 3) An Introduction to Surface Analysis by John F Watts and John Wolstenholme, 2<sup>nd</sup> Edition, Wiley VCH, 2011.

### REFERENCE BOOKS:

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

  
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**Course Code:** 18CY2119

**Course Name:** Analysis of Food and Drugs

**L-T-P-S:**

**Credits:**

**Prerequisite:** NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Understand the importance of food analysis	1	3
CO2	Determination of various nutrients in food samples	3	3
CO3	Identification of food adulterants	2	3
CO4	Employ quantitative methods of analysis in food samples	6	3

**Syllabus:**

Importance of food analysis, Determination of approximate composition: Moisture, fat, protein, fiber, carbohydrate, etc. Quantitative analysis for food quality and safety - Determination of minerals, vitamins, antioxidants, toxins and preservatives. General idea of the properties of drugs for their characterization and quantification. Quantitative methods of analysis - Gravimetric and volumetric analysis, potentiometry, coulometry and amperometry titrations, colorimetry, fluorimetry and polarimetry methods.

**TEXTBOOKS:**

- 1) Food Analysis, Food Science Texts Series by S Suzanne Nielsen, 3<sup>rd</sup> Edition, Springer, 2003.
- 2) Pharmaceutical Analysis by D Lee and M Webb, 1<sup>st</sup> Edition, Blackwell, 2003.

**REFERENCE BOOKS:**

- 1) Food Analysis, Food Science Texts Series by S Suzanne Nielsen, 3<sup>rd</sup> Edition, Springer, 2003.
- 2) Pharmaceutical Analysis by D Lee and M Webb, 1<sup>st</sup> Edition, Blackwell, 2003.

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Course Code: 18CY2214

Course Name: Advanced Applied Analysis

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


Credits: 7

Prerequisite: NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Understand the principles, methodology and adoptability various procedures for the analysis of Analysis of Iron, Manganese, Chromite, Phosphate and Aluminum Ores.	1	3
CO2	Discuss, explain, and illustrate the applications of the general methods of analysis for finished products such as Steel, dolomite, fire clay, four spar and magnesite.	1	3
CO3	Finding the adoptability by applying the general methods of analysis for Cement, Soaps, Oils, and paints analysis.	1	3
CO4	Explain and apply the various principles involved in the chemical and physicochemical analysis of Organic Functional Groups.	1, 4	3

### Syllabus:

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.; (a) Primary pollutants:(i) Carbon compounds - Carbon monoxide(CO) and Carbon dioxide(CO<sub>2</sub> ).; (ii) Sulphur compounds- sulphur dioxide (SO<sub>2</sub>), Sulphur trioxide (SO<sub>3</sub>) and Hydrogen Sulphide (H<sub>2</sub>S).;(iii) Nitrogen compounds - nitric oxide (NO),and nitrogen dioxide (NO<sub>2</sub>);(iv) Hydrocarbons - Aliphatic hydrocarbons and polycyclic aromatic hydrocarbons (PAH).;(v) Particulate matter - Repairable and Suspended particulate matter, Inorganic and Organic particulates.; (b) Secondary pollutants - ozone (O<sub>3</sub>), peroxy acetyl nitrate (PAN), peroxy benzyl nitrate (PBN); (c) Standards for ambient air quality.; Kinetic Methods of Analysis & Non aqueous Titrimetry; (a) 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.; (b) Non aqueous titrimetry : Classification of solvents and titrations for non-aqueous titrimetry- Types of reactions - Indicators ;(i) Determination of acids;(ii) Determination of bases,(iii) Karl-Fisher reagent for the determination of moisture content in drugs and other samples.

  
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List of Experiments:

**1. Complexometric titrations**

- (i) Analysis of zinc in zinc ore by using EDTA
- (ii) Analysis of nickel by EDTA
- (iii) Analysis of limestone or dolomite

**2. 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

**3. Analysis of coal**

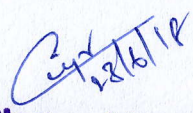
- (i) moisture content
- (ii) volatile matter
- (iii) fixed carbon ash content

**TEXTBOOKS:**

- 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.

**REFERENCE BOOKS:**

- 1) Analytical Chemistry, An Introduction, D.A Skoog, D.M West and F.J Holler, Sanders College Publishing, New York
- 2) Quantitative Chemical Analysis by I.M Kolthoff, E.B Sandel, E.J Meehan, S. Bruckenstein, Macmillan Company, London

  
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Course Code: 18CY2215

Course Name: Advanced Instrumental Methods of Analysis

L-T-P-S: 3-0-0-0

Credits: 3

Prerequisite: NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Discuss and understand the principles and instrumentation involved in Flame photometry. Atomic Absorption Spectrometer, inductively coupled plasma spectrometer and Arc and Spark spectrographic Direct analysis.	1	3
CO2	Discuss and apply the various principles and methodology in TGA, DTA and DSC.	3	3
CO3	Discuss and apply the principles and methodology involved in Voltammetry, polarography, Anode stripping voltammetry and Coulometry.	2,4	3
CO4	Discuss the principles and methodology in assaying the analytes using Ion Selective Electrodes and Radio chemical methods.	1	3

**Syllabus:** Spectro-analytical methods of analysis:(a)Flame photometry: theory, instrumentation, combustion flames, detectors, and analysis of Na, K, Ca, Mg(b)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 (c)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.(d) Arc and Spark spectrographic Direct analysis of solid for metals. Thermal methods of Analysis (a) Thermo gravimetry-theory, instrumentation, applications with special reference to  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ,  $\text{CaC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ ,  $\text{CaCO}_3$ ,  $(\text{COOH})_2 \cdot 2\text{H}_2\text{O}$ . (b) Differential thermal analysis-principle, instrumentation, difference between TG and DTA - applications with special reference to the clays and minerals, coals (fuels). (c)Differential scanning calorimetry-principle, instrumentation, applications to inorganic materials like chlorates and per chlorates, ammonium nitrate, organic compounds and Drugs.Electro analytical Methods of Analysis – 1-Voltametry and polarographic analysis : principle of polarography, residual current, migration current, diffusion current, half-wave potential, Ilkovic equation, instrumentation, Dropping mercury electrode (DME), advantages and disadvantages of DME, qualitative and quantitative analysis of inorganic ions-Cu, Bi, Pb, Cd, Zn, AC polarography, pulse polarography. Anode stripping voltammetry: principle,

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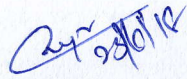
instrumentation, hanging mercury drop electrode, application in the analysis of Pb and Cd in environmental samples, principle of cathode stripping voltammetry. Coulometric analysis: principles of coulometric analysis with constant current, coulometric analysis with controlled potential, applications of coulometric methods for the analysis of cations-As (III), Fe (II) and I<sup>-</sup> and S<sup>2-</sup> by using I<sub>2</sub> liberations and Ce<sup>4+</sup> liberation in solutions. electro analytical and radio chemical methods of analysis – 2; Ion Selective Electrodes: reference electrodes - hydrogen electrode, calomel electrode, silver chloride electrode; indicator electrodes - hydrogen and glass electrodes, theory of membrane potentials and liquid junction potentials, types of ion selective electrodes, basic properties, potentials and construction, calibration of ion selective electrodes, ion selective electrodes with fixed membrane sites, silver, lead, cadmium, sulfide, fluoride, cyanide and glass electrodes, applications in the analysis of air and water pollutants, principles of liquid membrane, gas sensing and enzyme based electrode. 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, radiocarbon dating technique.

#### TEXTBOOKS:

- 1) Chemical analysis by H.A Laitinan, Mc Graw Hill Book Co
- 8) Standard methods of Chemical Analysis by Welcher
- 9) Technical Methods of Analysis by Griffin, Mc Graw Hill
- 10) Commercial Methods of Analysis by Foster Dee Sneel and Frank M. Griffin, Mc Graw Hill Book Co.
- 11) Environmental Chemistry by Anil Kumar De, Wiley Eastern Ltd.
- 12) Environmental Analysis by S.M Khopkar (IIT Bombay)
- 13) Environmental Air Analysis by Trivedi and Kudesia, Akashdeep Pub.

#### REFERENCE BOOKS:

- 3) Analytical Chemistry, An Introduction, D.A Skoog, D.M West and F.J Holler, Sanders College Publishing, New York
- 4) Quantitative Chemical Analysis by I.M Kolthoff, E.B Sandel, E.J Meehan, S. Bruckenstein, Macmillan Company, London

  
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Course Code: 18CY2216

Course Name: Classical Methods of Analysis

L-T-P-S: 3-0-0-0

Credits: 3

Prerequisite: NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Understand the principles of Quality control in Analytical Chemistry	1	3
CO2	Explain the various concepts of decomposition techniques in analysis	1	3
CO3	Illustrate, discuss, and apply the various principles behind the various Redox systems involved in the classical Volumetric methods of Analysis.	1	3
CO4	Explain the various principles involved in the analysis of Organic Functional Groups	1,2,3,4,5,6	3

### Syllabus:

#### Water analysis

- (i) analysis of water for total hardness ( $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ )
- (ii) analysis of water for chloride ( $\text{Cl}^-$ )
- (iii) analysis of water for alkalinity ( $\text{CO}_3^{2-}$ ,  $\text{HCO}_3^-$ )
- (iv) analysis of dissolved oxygen (DO) in drinking water and sewage water
- (v) analysis of chemical oxygen demand (COD) in drinking water and sewage water

#### 2. Fertilizer analysis

- (i) analysis of fertilizer for ammonia, nitrate and phosphate

#### 3. Analysis of iron ore

- (i) complete analysis of iron ore
- (ii) analysis of iron ore (with special reference to percentages of Fe (II) and Fe (III) present in the sample)

### INSTRUMENTAL METHODS OF ANALYSIS-I

#### 1. pH metry

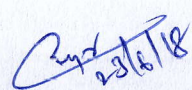
- (i) Determination of alkalinity in a colored effluent using pH metric end point
- (ii) Determination of purity of commercial  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{H}_3\text{PO}_4$  and  $\text{CH}_3\text{COOH}$  using pH metric end point

#### 2. Conductometry

- (i) Determination of a mixture of strong acid and weak acid present in a colored effluent

#### 3. Potentiometry

- (i) Determination of Cr (VI) with Fe (II) using potentiometric end point
- (ii) Determination of a mixture of Ce (IV) and V (V) with Fe (II) using potentiometric end point
- (iii) Determination of a mixture of Mn (VII) and V (V) with Fe (II) using potentiometric end point
- (iv) Determination of a mixture of bromide and chloride with  $\text{AgNO}_3$  using potentiometric end point
- (v) Determination of  $\text{KSCN}$  with  $\text{AgNO}_3$  using potentiometric end point

  
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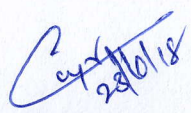


**TEXTBOOKS:**

- 1) Chemical analysis by H.A Laitinan, Mc Graw Hill Book Co
- 14) Standard methods of Chemical Analysis by Welcher
- 15) Technical Methods of Analysis by Griffin, Mc Graw Hill
- 16) Commercial Methods of Analysis by Foster Dee Sneel and Frank M. Griffin, Mc Graw Hill Book Co.
- 17) Environmental Chemistry by Anil Kumar De, Wiley Eastern Ltd.
- 18) Environmental Analysis by S.M Khopkar (IIT Bombay)
- 19) Environmental Air Analysis by Trivedi and Kudesia, Akashdeep Pub.

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- 1) Analytical Chemistry, An Introduction, D.A Skoog, D.M West and F.J Holler, Sanders College Publishing, New York
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**Course Code:** 18CY2104

**Course Name:** Techniques for modern industrial applications

**L-T-P-S:** 3-0-0-0

**Credits:** 3

**Prerequisite:** NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Apply the theory and principles of chromatographic separation.	1,5	3
CO2	Categorize and use a suitable adsorption chromatography or electrophoretic techniques for actual analytical problems	1,5	3
CO3	Suggest and justify most suitable and efficient separation technique to be employed for an analysis based on strengths and limitations of GC and HPLC.	1,5	3
CO4	Illustrate the properties, significance and use of biopolymers and coumarins as tools in molecular research based on their structure	1,5	3

**Syllabus:**


X-ray Absorption Spectroscopy: Principles, Rotating single crystal method, Powder crystal method, Interpretation of diffraction patterns, small angle X-ray diffraction analysis, Electron diffraction methods, Neutron diffraction methods: small angle neutron diffraction (SANS) analysis. Scanning electron microscopy: Scanning Electron Microscope, Energy Dispersive X-ray spectrometry (EDX), Field-emission SEM (FESEM); analysis. Transmission electron microscopy: Instrumentation, Imaging surface structures. Scanning tunneling microscopy: Instrumentation, Surface imaging by STM, STM Lithography. Atomic force microscopy: Chemical force microscopy, AFM Lithography.

**TEXTBOOKS:**

- 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
- 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 Kamallesh Bansal, 1<sup>st</sup> edition.
- 3) Instrumental methods of chemical analysis by Willard, Dean and Meritte- 6<sup>th</sup> edition.
- 4) Analytical chemistry principles by John H. Kenedey- 2<sup>nd</sup> 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.

  
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Course Code: 18CY2105

Course Name: Advanced Heterocyclic Chemistry

L-T-P-S: 3-0-0-0

Credits: 3

Prerequisite: NIL

CO#	Course Outcome (CO)	PO	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	3
CO2	Apply the aromaticity, reactivity, and synthesis of Five, six membered heterocyclic compounds with two hetero atoms	2	3
CO3	Apply the aromaticity, reactivity, and synthesis of heterocyclic compounds with more than hetero atoms	3	3
CO4	Apply the synthesis, structure, reactivity, and stability of larger ring heterocyclics	1	3

### Syllabus:

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, Oxiranes, 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 Thiepinines. Synthesis and rearrangement of Diazepines. Synthesis of Benzoazepines, Benzodiazepines, Benzoxepines, Benzothiepinines, Azocines, and Azonines. Benzannulated azoles and dipolar structures: Benzannulated azoles: Synthesis and reactivity of Benzimidazoles, Benzoxazoles and Benzothiazoles. Heterocycles 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. Meso-ionic heterocycles: Synthesis and aromaticity of sydnones and 1,3-dipolar addition reaction of meso-ionic heterocycles.

### TEXTBOOKS:

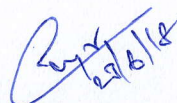
1. Organic Chemistry by P. Y. Bruice, 5<sup>th</sup> Ed., Pearson, 2014.
- 2) Introduction to Bioorganic Chemistry and Chemical Biology by D.V. Vranken and G.A. Weiss, 1<sup>st</sup> Ed., Garland Science, 2012.
- 3) Essentials of Carbohydrate Chemistry and Biochemistry by T. K. Lindhorst, 3<sup>rd</sup> Ed., Wiley 2007.
- 4) Peptides: Chemistry and Biology by N. Scwald and H.D Jakubke, 2<sup>nd</sup> Ed. Wiley, 2009.

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Green Fields, Vaddeswaram-522 302,  
Guntur Dist. A.P. India



**REFERENCE BOOKS:**

1. Organic Chemistry by P. Y. Bruice, 5<sup>th</sup> Ed., Pearson, 2014.
- 3) Introduction to Bioorganic Chemistry and Chemical Biology by D.V. Vranken and G.A. Weiss, 1<sup>st</sup> Ed., Garland Science, 2012.
- 3) Essentials of Carbohydrate Chemistry and Biochemistry by T. K. Lindhorst, 3<sup>rd</sup> Ed., Wiley 2007.
- 4) Peptides: Chemistry and Biology by N. Sewald and H.D Jakubke, 2<sup>nd</sup> Ed. Wiley, 2009.

  
29/6/18

**Dr. J.V. Shanmukha Kumar**  
Head of the Department  
Department of Chemistry  
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Green Fields, Vaddeswaram-522 302,  
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Course Code: 18CY2106

Course Name: Bio Organic Chemistry

L-T-P-S: 3-0-0-0

Credits: 3

Prerequisite: NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Recognize the structure and function of Carbohydrates, Lipids, Amino acids, proteins, nucleotides, and nucleic acids.	1	3
CO2	Understand the reactions of the major catabolic and anabolic pathways of carbohydrates, Lipids, Amino acids, metabolism.	1	3
CO3	Understand the signaling pathways of Lipids and Amino acids.	1,4	3
CO4	Demonstrate the chemistry and kinetics of enzymes.	1,4	3

### Syllabus:

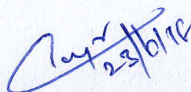
Amino acids, peptides, and proteins Amino acids: acid base properties, isoelectric point, separation, resolution of racemic mixtures of amino acids, asymmetric synthesis Peptide bonds: peptide secondary structures and their stabilization, strategies for peptide synthesis, automated peptide synthesis. Primary, secondary, tertiary and quaternary structures, protein denaturation, natural  $\beta$ -amino acids and  $\beta$ -peptides;  $\beta$ -turn peptidomimetics,  $\beta$ -lactam based peptidomimetics. Enzymes Classification of enzymes, enzyme catalysis and kinetics, nucleophilic acid, base and metal-ion catalysis, the catalytic triad, mechanisms of carboxypeptidase A, serine proteases and lysozyme, enzyme inhibition and drug design. Nucleosides and nucleotides, conformation of sugar-phosphate backbone, hydrogen bonding by bases, the double helix, A, B, and Z double helices.

### TEXTBOOKS:

- 1) Organic Chemistry by P. Y. Bruice, 5<sup>th</sup> Ed., Pearson, 2014.
- 4) Introduction to Bioorganic Chemistry and Chemical Biology by D.V. Vranken and G.A. Weiss, 1<sup>st</sup> Ed., Garland Science, 2012.
- 3) Essentials of Carbohydrate Chemistry and Biochemistry by T. K. Lindhorst, 3<sup>rd</sup> Ed., Wiley 2007.
- 4) Peptides: Chemistry and Biology by N. Sewald and H.D Jakubke, 2<sup>nd</sup> Ed. Wiley, 2009.

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- 1) Essentials of Carbohydrate Chemistry and Biochemistry by T. K. Lindhorst, 3<sup>rd</sup> Ed., Wiley 2007.
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Course Code: 18CY2107

Course Name: Green Chemistry

L-T-P-S: 3-0-0-0

Credits: 3

Prerequisite: NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Explain basic principles of green and sustainable chemistry.	1,4	3
CO2	Understand the Stoichiometric calculations and relate them to green process metrics.	1,4	3
CO3	Review the principles of catalysis, photochemistry, and other interesting processes from the viewpoint of Green Chemistry.	1,4	3
CO4	Apply alternative solvent media and energy sources for chemical processes.	1,4	3

### Syllabus:

Principles of Green Chemistry, Concept of atom economy, Tools of Green Chemistry: Alternative feedstocks/starting materials, Reagents, Solvents, Product/target molecules, Catalysis, and process analytical chemistry. Evaluation of chemical products or processes for its effect on human health and environment. Evaluation of reaction types and methods to design safer chemicals. Evaluating the effects of Chemistry: Toxicity to humans, Toxicity to wildlife, Effects on local environment, Global environmental effects. Planning a green synthesis. Applications of Green Chemistry: Green synthesis of Ibuprofen, Design and application of surfactants for carbon dioxide for precision cleaning in manufacturing and service industries, Polyester regeneration technology, Microbes as environmentally benign synthetic catalysts, environmentally safe marine antifoulant. Biodegradable polyaspartate polymers for inhibitors and dispersing agents, recent applications in green chemistry.

### TEXTBOOKS:

- 1) Introduction to Industrial Chemistry by Howard, W.L., Wiley-Interscience.
- 2) Industrial Organic Chemistry by Weissmerl, K., and Arpe, H.J., 3<sup>rd</sup> ed.
- 3) Green Chemistry and Catalysis by Sheldon, R.A., Arends, I., and Hannefed, U., Wiley-VCH Verlag GmbH and Co.
- 4) Green Chemistry Frontiers in Benign Chemical Synthesis and Processes by Anastas, P., and Williamson, T. C., Oxford University Press.
- 5) New Trends in Green Chemistry by Ahluwalia, V. K., and Kidwai, M., Anamaya Publishers

### REFERENCE BOOKS:

- 1) Green Chemistry and Catalysis by Sheldon, R.A., Arends, I., and Hannefed, U., Wiley-VCH Verlag GmbH and Co.
- 2) Green Chemistry Frontiers in Benign Chemical Synthesis and Processes by Anastas, P., and Williamson, T. C., Oxford University Press.
- 3) New Trends in Green Chemistry by Ahluwalia, V. K., and Kidwai, M., Anamaya Publishers

*Rykr*  
*25/6/18*  
**Dr. J.V. Shanmukha Kumar**  
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Course Code: 18CY2108

Course Name: Food Chemistry

L-T-P-S:

Credits:

Prerequisite: NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Explain properties and reactions of carbohydrates, lipids and proteins during storage and processing of food.	1	3
CO2	Identify the important sources of vitamins and minerals in food and their affect in quality aspects of food.	2	3
CO3	Explain the importance of water for stability and quality of food.	4	3
CO4	Understand the sources of important classes of undesirables in food and the HACCP term.	1,4	3

### Syllabus:

Source, functions of food – food groups – food guide – basic five food groups, usage of the food guide – food in relation to health – objectives of cooking. Water: Purification processes – Ion exchangers, reverse osmosis, activated charcoal treatment. Effect of cooking and heat processing of milk pasteurization, Preservation of milk. Deep freeze preservation, dairy products: cheese, butter, ghee and kova. Spray drying technique – milk powder, infant food preparation. Lactose intolerance Milk substitutes – vegetable milk. Amino acids – peptides – proteins, modification of food products through heat processing. Effect of cooking – steaming or cooking under pressure of legumes. Detoxication. Analysis of proteins principles in the determination of moisture content, ash content, nitrogen content – Kjeldahl's method. Separation of amino acids by paper chromatography, separation of proteins by electro phoresies. Classification, structure and reactions of monosaccharides, glucose, fructose, structure of sucrose, maltose, lactose and starch. Artificial sweetening agents. Effect of cooking on the nutritive value of rice and of baking of wheat – bread and biscuit, processing and storage of carbohydrates. Principles involved in the analysis of carbohydrates – analysis of glucose, starch, Benedict method, Anthrone method, Neilson–Somoyogi method, analysis of crude fibers – estimation of carbohydrates in wheat floor.

### TEXTBOOKS:

- 1) Advanced Textbook on Food and Nutrition by Swaminathan M. Volume I and II Printing and Publishing CO., Ltd., Bangalore. 1993.
- 2) Textbook on Food Chemistry by Swaminathan M. Printing and Publishing CO., Ltd., Bangalore. 1993.
- 3) Food science by Norman N. Potter, CBS publishers and distributors New Delhi. 1994.
- 4) Food Chemistry by Lillian Hoagol and Meyer CBS publishers and distributors, New Delhi. 1994.

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- 1) Advanced Textbook on Food and Nutrition by Swaminathan M. Volume I and II Printing and Publishing CO., Ltd., Bangalore. 1993.
- 2) Textbook on Food Chemistry by Swaminathan M. Printing and Publishing CO., Ltd., Bangalore. 1993.
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*Signature*  
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Course Code: 18CY2109

Course Name: Medicinal Chemistry

L-T-P-S: 3-0-0-0

Credits: 3

Prerequisite: NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	To understand the drug metabolic pathways adverse effects and the therapeutic value of drugs.	1	3
CO2	To know the structure activity relationship of the different class of drugs.	4	3
CO3	To describe the mechanisms pathways of different class of medicinal compounds.	2	3
CO4	To understand the chemistry of drugs with respect to their pharmacological activity	4	3

### Syllabus:

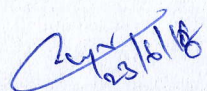
Classification and Nomenclature of Drugs. Medicinal chemistry: Important terminology in medicinal chemistry. Classification and Nomenclature of Drugs. Concept of prodrugs and soft drugs. a) Prodrugs: i) Prodrugs designing, types of prodrugs. Prodrug formation of compounds containing various chemical groups, Prodrugs, and drug delivery system b) Soft drugs: i) Soft drug concept, ii) Properties of soft drug. Theories of drug activity. i) Occupancy theory, ii) Rate theory, iii) Induced theory. QSAR method: Introduction, Methods used in QSAR studies, Hansch method, Free-Wilson method, Advantages and disadvantages of free approach, Computer based methods of QSAR related to receptor binding, Physico-Chemical properties, Lipophilicity, Electronic parameters, Steric substituent constants, Experimental determination of partition coefficients. Structure based drug design. i) Process of structure based drug design, ii) Deactivation of certain drug, iii) Determination of the structure of the protein, iv) Design of inhibitors. Molecular modelling using computers. i) Introduction ii) Uses of molecular modelling: a) Manual use, b) Further-computer programming, c) X-ray crystallography. Pharmacokinetics and Pharmacodynamics. A] Pharmacokinetics: a) Drug absorption, b) Distribution, c) Elimination, d) Disposition B] Pharmacodynamics. a) Introduction, Elementary treatment of enzyme inhibition, b) Membrane active drug, c) Sulphonamides Mechanism of action of following drugs: Action of CNS disorder, inflammation, cardiac dysfunction. MC-4: Drug metabolism.

### TEXTBOOKS:

1. Burger's Medicinal Chemistry and Drug Discovery by M.E. Wolf, Vol. I, John Wiley.
2. Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw-Hill.
3. Organic Chemistry by I.L. Finar, Vol.-2, ELBS.

### REFERENCE BOOKS:

1. Burger's Medicinal Chemistry and Drug Discovery by M.E. Wolf, Vol. I, John Wiley.
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Course Code: 18CY2110

Course Name: Nano Chemistry

L-T-P-S: 3-0-0-0

Credits: 3

Prerequisite: NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Describe a working knowledge of the basic concept of nano chemistry and changes of chemical and physical properties.	1,2,5	3
CO2	Analyse several synthetic methods for the fabrication of nano particles.	1,2,3	3
CO3	Apply the links between structure and catalytical activity of the nanomaterials.	1,3,7	3
CO4	Illustrate the application and prospects of nano chemistry	1,4,5	3

### Syllabus:

Scope and importance of nanoscience and nanotechnology. Synthetic Methods: Chemical Routes: Physical methods, Techniques for characterization. BET method for surface area analysis. Dynamic light scattering for particle size determination. Synthesis, properties and applications of fullerenes, carbon nanotubes, core-shell nanoparticles, self- assembled monolayers, nanocrystalline materials, magnetic nanoparticles thermoelectric materials. Non-linear optical materials, liquid crystals.

### TEXTBOOKS:

- 1) NANO: The Essentials by T. Pradeep, McGraw-Hill, 2007.
- 2) Textbook of Nanoscience and Nanotechnology by B S Murty, P Shankar, Baldev Rai, B B. Rath and James Murday, Univ. Press, 2012.

### REFERENCE BOOKS:

- 1) NANO: The Essentials by T. Pradeep, McGraw-Hill, 2007.
- 2) Textbook of Nanoscience and Nanotechnology by B S Murty, P Shankar, Baldev Rai, B B. Rath and James Murday, Univ. Press, 2012.

*Cy2*  
*28/10/18*  
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Course Code: 18CY2204

Course Name: Advanced Organic Spectroscopy

L-T-P-S: 3-0-0-0

Credits: 3

Prerequisite: NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Outline optical rotatory dispersion and circular dichroism.	1	3
CO2	Examine the separation of chemical shifts and coupling on 2D axis	1	3
CO3	Take part in fragmentation of organic molecules associated with functional groups	1	3
CO4	Elucidate organic structures using mass fragmentation ORD&CD	1,2,3	3

### Syllabus:

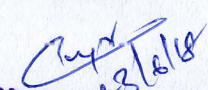
Optical Rotatory dispersion and circular dichroism: phenomenon ORD and CD. Classification of ORD and CD curves; cotton effect curves and their application to Stereochemical problems; the octant rule and its application to alicyclic ketones. The separation of Chemical shift and coupling on to two different axes (2D-NMR, Cosy), spin decoupling, the nuclear over hauser effect associating the signal from directly bonded  $^{13}\text{C}$  and  $^1\text{H}$ . ESR derivative curves: Values and hyperfine splitting. Fragmentation processes: fragmentation associated with functional groups; rearrangement and mass spectra of some chemical classes. Structural elucidation of Organic Compounds by a combined application of the special method (UV, IR, NMR and Mass).

### TEXTBOOKS:

- 1) Spectroscopic Methods in Organic Chemistry by D.M. Williams and I. Fleming Tata McGraw Hill, 4<sup>th</sup> Edition, New Delhi, 1990. For all spectral methods except ORD and CD and ESR.
- 2) Organic Spectroscopy by W. Kemp, 2<sup>nd</sup> Edition, ELBS Macmillan, 1987 for ORD and CD and ESR.
- 3) Applications of absorption spectroscopy of Organic Compounds by J.R.Dyer, Prentice Hall of India, New Delhi, 1984.
- 4) Spectrometric identification of Organic Compounds by R.M.Silverstein, G.C.Vasslellr and T.C. Merrill, John Wiley, Singapore, 1981.

### REFERENCE BOOKS:

- 1) Spectroscopic Methods in Organic Chemistry by D.M. Williams and I. Fleming Tata McGraw Hill, 4<sup>th</sup> Edition, New Delhi, 1990. For all spectral methods except ORD and CD and ESR.
- 2) Organic Spectroscopy by W.Kemp, 2<sup>nd</sup> Edition, ELBS Macmillan, 1987 for ORD and CD and ESR.
- 3) Applications of absorption spectroscopy of Organic Compounds by J.R.Dyer, Prentice Hall of India, New Delhi, 1984.
- 4) Spectrometric identification of Organic Compounds by R.M.Silverstein, G.C.Vasslellr and T.C. Merrill, John Wiley, Singapore, 1981.

  
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**Course Code:** 18CY2205

**Course Name:** Natural Products and Biomolecules

**L-T-P-S:** 3-0-0-0

**Credits:** 3

**Prerequisite:** NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Illustrate the synthesis and significance of microbial metabolites	1	3
CO2	Outline the origin & chemical nature of Terpenes	1	3
CO3	Outline the origin & chemistry of Alkaloids	1	3
CO4	Demonstrate properties & synthetic methods of peptides	1	3

### Syllabus:

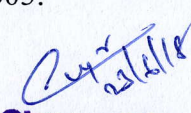
Structure, isolation, stereochemistry and synthesis of the following class of natural products from plant, animal and microbial sources: Acetogenins and shikimates: Microbial metabolites: Pencillin G, Cephalosporin-Ö and streptomycin. Terpenoids: Forskolin, taxol and azadirachtin. Biogenesis and biological properties of the Pencillin G, Cephalosporin-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:  $\alpha$ -Aminoacids. Synthesis of peptides by Merrifield solid phase synthesis. Chemistry of oxytocin and dolastain-10.

### TEXTBOOKS:

1. Organic Chemistry by I.L. Finar Vol. I and II, 9<sup>th</sup> Edition, Pearson, 2009.
2. Medicinal Chemistry by Graham L. Patrick, Oxford University Press, 2005.

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Course Code: 18CY2206

Course Name: Organometallic Chemistry

L-T-P-S: 3-0-0-0

Credits: 3

Prerequisite: NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	To explain the structure, synthesis, bonding, properties of the transition metal organo compounds.	1	3
CO2	To describe the industrial significant processes through the application of organo metallic principles.	1	3
CO3	To utilize the professional level skills in a chemical synthetic laboratories safety especially in the areas of air sensitive reagents.	1	3
CO4	Demonstrate affective report writing, experimental design and data analysis.	1	3

### Syllabus:

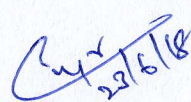
Classification of Organometallic compounds, Metal alkyl-metal aryl complexes, Metal carbenes and metal carbines, Oxidative addition, reductive elimination, Migratory insertion reactions. Ligand substitution reactions and Fluxoinality in Organometallic compounds, Metal clusters. Capping rule, Mingos rule, Carbide clusters clusters having interstitial main group elements. Applications of organometallics as catalysts, C-C and C-N.

### TEXTBOOKS:

- 1) Advanced Organic Chemistry by F.A. Carey and R.J Sundberg, Plenum.
- 2) Structure and Mechanism in Organic Chemistry by C.K.Inglod, Cornell University Press.
- 3) Organic Chemistry by R.T Morrison and R.N. Boyd, Prentice - Hall.
- 4) Modern Organic Reactions by H.O. House, Benjamin.

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Program structure (with all Courses) containing following categorization

Course Code	Course Name	Course Category	L	T	P	S	CR	Pre-Req u i s i t e	New Course/Revi s e d Course/ Retained Course	Stakeholder Categor y	Justification for considering the feedback
18CY1101	General Chemistry-I	Prof. Core	4	0	0	0	4	-	Retained	NA	Employability
18CY1102	Inorganic Chemistry- I	Prof. Core	4	0	6	0	7	-	Retained	NA	Employability
18CY1103	Organic Chemistry-I	Prof. Core	4	0	6	0	7	-	Retained	NA	Employability
18CY1104	Physical Chemistry-I	Prof. Core	4	0	6	0	7	-	Retained	NA	Employability
18CY1201	General Chemistry-II	Prof. Core	4	0	0	0	4	-	Retained	NA	Employability
18CY1202	Inorganic Chemistry- II	Prof. Core	4	0	6	0	7	-	Retained	NA	Employability
18CY1203	Organic Chemistry-II	Prof. Core	4	0	6	0	7	-	Retained	NA	Employability
18CY1204	Physical Chemistry-II	Prof. Core	4	0	6	0	7	-	Retained	NA	Employability
18CY2111	Separation Techniques -I	Prof. Core	4	0	6	0	7	-	Retained	NA	Skill Development
18CY2112	Quality Control and Traditional Methods of Analysis-I	Prof. Core	4	0	6	0	7	-	Retained	NA	Skill Development
18CY2113	Applied Analysis	Prof. Core	4	0	0	0	4	-	Retained	NA	Employability
18CY2101	Photo Chemistry and pericyclic reactions	Prof. Core	4	0	0	0	4	-	Retained	NA	Employability
18CY2102	Organic Synthesis-I	Prof. Core	4	0	6	0	7	-	Retained	NA	Skill Development
18CY2103	Organic Spectroscopy	Prof. Core	4	0	6	0	7	-	Retained	NA	Employability
18CY2211	Separation Methods – II	Prof. Core	4	0	6	0	7	-	Retained	NA	Employability
18CY2212	Traditional Methods of Analysis - II	Prof. Core	4	0	6	0	7	-	Retained	NA	Employability
18CY2213	Dissertation with Research Publication	Skill	0	0	12	0	6	-	Retained	NA	Skill Development
18CY2201	Organic Reaction Mechanisms and Named Reactions	Prof. Core	4	0	6	0	7	-	Retained	NA	Employability
18CY2202	Organic Synthesis-2	Prof. Core	4	0	6	0	7	-	Retained	NA	Employability
18CY2203	Dissertation with Research Publication	Skill	0	0	12	0	6	-	Retained	NA	Skill Development
18CY2114	Instrumental Methods of Analysis	Prof. Electives	3	0	0	0	3	-	NEW	Faculty, academic peers	Skill Development
18CY2115	Applications of Chemical Spectroscopy	Prof. Electiv	3	0	0	0	3	-	NEW	Alumni, faculty	Skill Development

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		es									
18CY2116	Bio analytical Chemistry	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development
18CY2117	Environmental Chemistry	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development
18CY2118	Surface Analytical Techniques	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development
18CY2119	Analysis of Food and Drugs	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development
18CY2104	Techniques for modern industrial applications	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development
18CY2105	Advanced Heterocyclic chemistry	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development
18CY2106	Bio Organic Chemistry	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development
18CY2107	Green Chemistry	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development
18CY2108	Food Chemistry	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development
18CY2109	Medicinal chemistry	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development
18CY2214	Advanced Applied Analysis	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development
18CY2215	Advanced Instrumental Methods of Analysis	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development
18CY2216	Classical Methods of Analysis	Prof. Electives	3	0	0	0	3	-	NEW	Academic peer, industry person, faculty	Skill Development

  
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18CY2204	Advanced Spectroscopy	Organic	Prof. Electives	3	0	0	0	3	-	NEW	Alumni, faculty, academic peers	Skill Development
18CY2205	Natural Products and Biomolecules		Prof. Electives	3	0	0	0	3	-	NEW	Faculty, academic peers	Skill Development
18CY2206	Organometallic Chemistry		Prof. Electives	3	0	0	0	3	-	NEW	Faculty, academic peers	Skill Development
18CY2110	Nano Chemistry		Prof. Electives	3	0	0	0	3	-	NEW	Faculty, academic peers	Employability

**Percentage of Syllabus Revision**= $18/38 = 7/38 = 20\%$

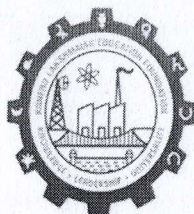
**Percentage of Courses focusing on Employability**= $15/38=40\%$

**Percentage of Courses focusing on Entrepreneurship**= Nil

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

*Signature*  
23/6/18  
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## Koneru Lakshmaiah Education Foundation

(Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

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25-5-2018

### DEPARTMENT OF CHEMISTRY Department Academic Committee (DAC) Minutes of Meeting, A.Y. 2018-19

The 3<sup>rd</sup> DAC meeting was conducted in HOD chemistry chamber on 25<sup>th</sup> May 2018 at 2.00 PM.

#### Agenda:

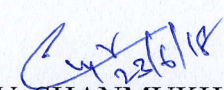
1. To propose final year students to publish their dissertation work.
2. To propose to prepare benchmark for M. Sc curriculum.

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.T.Bhaskara Rao        | Assistant Professor                        |
| 4  | Dr.Pradeep Kumar Brahman | Assistant Professor & RPAC Chairman        |
| 5  | Dr.A.Venkateswara rao    | Assistant Professor & Professor in Charge  |
| 6  | P Vasundhara             | 2 <sup>nd</sup> year M.Sc Student          |
| 7. | B Jagadeesh              | 2 <sup>nd</sup> year M.Sc Student          |

The following points were discussed and resolved:

1. Need to introduce Prof. Electives into curriculum for 2018 admitted batch of M. Sc Chemistry programme.
2. The DAC discussed and resolved to initiate dissertation work in 3<sup>rd</sup> semester instead of 4<sup>th</sup> semester to get academic publication could be useful for getting placement or for higher studies.
3. The DAC discussed to prepare benchmark for M. Sc curriculum comparing with two premier institutes, one national and one international level.

  
(Dr. J. V. SHANMUKHA KUMAR)  
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