Koneru Lakshmaiah Education Foundation
(Deemed to be University estd. u/s. 3 of the UGC Act, 1956)
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XX Academic Council – Annexure 2.8

24-06-2020

DEPARTMENT OF CHEMISTRY
MINUTES OF 4th BOARD OF STUDIES MEETING

The department of chemistry conducted 4th BOS meeting on 24-06-2020 in virtual mode (**Google Meet link**: https://meet.google.com/mng-khgv-zum) 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 A Vani, Professor, Internal Member
4. Dr Y Anjaneyulu, Professor, Internal Member
5. Dr K Ravindranath, Professor, Internal Member
6. Dr M Sujatha, Associate Professor, Internal Member
7. Dr T Bhaskara Rao, Assistant Professor, Internal Member
8. Dr Pradeep Kumar Brahman, Assistant Professor, Internal Member
9. Dr A Venkateswara Rao, Assistant Professor, Internal Member
10. Dr S Naresh Varma, Assistant Professor, Internal Member
11. Dr G Sunita Sundari, Associate Professor- Physics, Internal Member
12. Dr B V Appa Rao, Professor- Mathematics, Internal Member
13. Dr C Suresh Reddy, Professor- S V University, Tirupati, External Member
14. Dr A Ramachandraiah, Professor- NIT Warangal, External Member
15. Dr K Nageswara Rao, Manager, M/S Trimax Biosciences, Raichur, Karnataka, External member
16. Dr Rajkumar Gangula, Principal Scientist, Aron research Center, Bangalore, External Member.
17. Dr Rama Mohan, Hindupur, External Member
18. Dr J Subba Rao, Hetero Labs, Special Invitee
19. Dr P V S N Murthy, Special Invitee

Members Absent:

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

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Dr. J. V. Shanmukha Kumar, the Chairman of the Board of Studies (BOS), initiated the meeting by extending a warm welcome to the external members and introduced them 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.

AGENDA and RESOLUTIONS

AGENDA ITEM 1:

Revise and suggest the curriculum for the 2020 intake of the Master of Science in Chemistry program.	Recommended for approval in academic council.

Recommendation:

The Chairman of the Board of Studies (BOS) presented the comprehensive curriculum for the M. Sc Chemistry program for the batch admitted in 2020 to all the committee members. Following thorough discussions and feedback from stakeholders, including Dr. Monima Sarma, Assistant Professor at KLEF; Dr. T Bhaskara Rao, Assistant Professor at KLEF; and Dr. A Venkateswara Rao, Assistant Professor at KLEF, external members such as Dr. A. Ramachandraiah from NIT Warangal proposed certain modifications or revisions to the curriculum as recommended by the BOS members.

Resolution:

- It is resolved and recommended for approval the change in titles and curriculum of the courses General Chemistry-I and General Chemistry-II to 20CY5101 - Theoretical Chemistry-I and 20CY5201 - Theoretical Chemistry-II, respectively.
- It is resolved and recommended for the approval of revising the contents of Theoretical Chemistry-II. This revision will align with new requirements including ORIGIN, CHEMDRAW, Molecular Modeling, and other relevant tools and concepts.

(Annexure 3: The detailed syllabus is given in annexure 3)

AGENDA ITEM 2:

To review and approve the decisions made by the Department Academic Committee (DAC) in the meeting dated 05-06-2020.	Recommended for approval in academic council.

Recommendation:

During the meeting, the agenda focused on evaluating the resolutions passed by the Department Academic Committee (DAC) on 05-06-2020. The committee members thoroughly reviewed each resolution, discussing their implications and relevance to the department's goals and objectives.

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Resolution:
The minutes of the Departmental Academic Committee (DAC) meeting held on June 5, 2020, were reviewed, endorsed, and recommended for approval in academic council.

AGENDA ITEM 3:

To update and align the curriculum in accordance with the latest CSIR-NET and GATE standards, ensuring it addresses contemporary societal and industrial requirements.	Recommended for approval in academic council.

Recommendation:
Considering the stakeholder (Dr. C. Suresh Reddy, Prof. S V University; Dr. B Pradeep Kumar, Asst. Prof., KLEF; Dr A Venkateswara Rao, Asst. Prof., KLEF, Dr. K. Deepti, Asst. Prof., KLEF; Dr J V Shanmukha Kumar, Prof., KLEF) feedback it is recommended that a comprehensive review of the current syllabus to be undertaken aligning the curriculum with the updated requirements of competitive examinations like CSIR-NET and GATE.

Resolution:

- It was resolved and recommended for approval in academic council to include Statistical Thermodynamics in place of soft materials in 20CY5204-Physical Chemistry-II.
- It was resolved and recommended for approval in academic council to revise the curriculum of 20CY5103-Organic Chemistry-I, Separation Techniques, Chromatographic Techniques & Method Validation

(Annexure 1: The detailed syllabus is given in annexure 1)

AGENDA ITEM 4:

To introduce new courses as professional electives in the MSC Chemistry Program for the 2020-21 admitted batch, aiming to address contemporary societal and industrial requirements.	Recommended for approval in academic council.

Recommendation:
In response to feedback from key stakeholders, including Dr. J. Subba Rao, Aurobindo pharma; Dr. A. Ramachandraiah, Prof. NIT Warangal; Dr. Monima Sarma, Asst. Prof., KLEF, Dr. J. Subba Rao, Aurobindo pharma; Dr. A. Ramachandraiah, Prof. NIT Warangal; Dr. Monima Sarma, Asst. Prof., KLEF, it is recommended to introduce new elective courses aligned with CSIR-NET and GATE standards. These additions, namely Supramolecular Chemistry, Drug Design & Development, and Chemo Sensors and Body Fluid Analysis, are intended to address current industrial requirements.

14/6/2020

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Resolution:

- It is resolved and recommended for approval in academic council to include new courses as professional electives and mapped as per CSIR-NET, GATE to meet the current societal and industrial needs.

- It is resolved and recommended for approval in academic council to introduce new courses as elective papers to meet the industrial needs.
  Supramolecular Chemistry
  Drug design& development
  Chemo Sensors and body fluid analysis

(Annexure 3: The detailed syllabus is given in annexure 3)

AGENDA ITEM-5

To include Design Thinking and Innovation (DTI) – 1and Design Thinking and Innovation (DTI) – 2 courses into the Curriculum from the academic year 2020-21.	Recommended for approval in academic council.

Recommendation:
It is recommended to integrate the Design Thinking and Innovation (DTI) - Course 1 and Design Thinking and Innovation (DTI) - Course 2 into the curriculum, commencing in the academic year 2020-21. This addition will provide students with valuable insights and skills in the areas of design thinking and innovation, equipping them for the challenges and opportunities of the future.

Resolution:

It was resolved and recommended for approval in academic council to include Design Thinking and Innovation (DTI)- 1and Design Thinking and Innovation (DTI)- 2 courses in to the Y19 Curriculum from academic year 2020-21 onwards based on the feedback given by industrial persons.

(Annexure 2: the detailed syllabus is given in annexure 2)

24/06/2020

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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. C. Suresh Reddy	External Member	Professor, SV 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	
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	
17	Dr.J.Subba Rao	Special Invitee	Manager, Aurobindo Pharma, Hyderabad	Special Invitee	
18	Dr.P V N S Murthy	Special Invitee	Co-Founder, Monvi Laboratories, Hyderabad	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	

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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
20CY5101	Theoretical Chemistry-I	Prof. Core	4	0	0	0	4	-	**NEW**	**BOS Members**	Employability	Covers the Theory Concepts which helps the students for attaining better employment
20CY5102	Inorganic Chemistry- I	Prof. Core	4	0	6	0	7	-	-	-	Employability	Covers the Concepts at molecular level which helps the students for attaining better employment
20CY5103	Organic Chemistry-I	Prof. Core	4	0	6	0	7	-	**Revised**	**Industry Person**	Employability	Covers the Industrial Concepts which helps the students for attaining better employment
20CY5104	Physical Chemistry-I	Prof. Core	4	0	6	0	7	-	-	-	Employability	Understand more about the progress of the reaction & mechanism of the reactions

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20CY5201	Theoretical Chemistry-II	Prof. Core	4	0	0	0	4	-	**NEW**	**BOS Members**	Employability	Covers the Theory Concepts which helps the students for attaining better employment
20CY5202	Inorganic Chemistry- II	Prof. Core	4	0	6	0	7	-	-	--	Employability	Covers the Concepts at molecular level which helps the students for attaining better employment
20CY5203	Organic Chemistry-II	Prof. Core	4	0	6	0	7	-	-	-	Employability	Covers the Industrial Concepts which helps the students for attaining better employment
20CY5204	Physical Chemistry-II	Prof. Core	4	0	6	0	7	-	**Revised**	**BOS Members**	Employability	Understand more about the progress of the reaction & mechanism of the reactions
20CY5301	Instrumental Methods of Analysis-I	Prof. Core	4	0	6	0	7	-	-	-	Skill Development	Covers the Industrial Concepts which helps the students for attaining better employment
20CY5302	Quality Control and	Prof.	4	0	0	0	4	-	-	-	Skill Development	Covers the

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	Classical Methods of Analysis	Core										Industrial Concepts which helps the students for attaining better employment
20CY5303	Applied Chemical Analysis	Prof. Core	4	0	6	0	7	-	-	-	Employability	Understand more about the progress of the reaction & mechanism of the reaction
20CY5310	Organic Synthesis-I	Prof. Core	4	0	6	0	7	-	-		Employability	Covers the Industrial Concepts which helps the students for attaining better employment
20CY5311	Natural Products and Bio-molecules	Prof. Core	4	0	6	0	7	-	-	-	Skill Development	Covers the Industrial Concepts which helps the students for attaining better employment
20CY5312	Organic Spectroscopy	Prof. Core	4	0	0	0	4	-	-	-	Employability	Covers the characterization of compounds & materials
20CY5401	Instrumental Methods of Analysis-I	Prof. Core	4	0	6	0	7	-	-	-	Employability	Covers the Industrial Concepts which helps the

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												students for attaining better employment
20CY5402	Advance Applied Chemical Analysis	Prof. Core	4	0	6	0	7	-	-	-	Employability	Covers the Industrial Concepts which helps the students for attaining better employment
20CY5403	Dissertation with Research Publication	Skill Development	0	0	12	0	6	-	-		Skill Development	Student will get the more knowledge about the research orientation subject.
20CY5407	Organic Synthesis-II	Prof. Core	4	0	6	0	7	-	-	-	Employability	Covers the Industrial Concepts which helps the students for attaining better employment
20CY5408	Advance Heterocyclic chemistry	Prof. Core	4	0	6	0	7	-	-	-	Employability	Covers the Industrial Concepts which helps the students for attaining better employment
20CY5409	Dissertation with Research Publication	Skill Development	0	0	12	0	6	-	-	-	Skill Development	Student will get the more knowledge about the research

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												orientation subject.
20CY5304	Separation Techniques	Prof. Elective	3	0	0	0	3	-	**Revised**	**BOS Members & Industry Person**	Skill Development	Concepts will help in handling the instruments in the industry
20CY5305	Applications of Chemical Spectroscopy	Prof. Elective	3	0	0	0	3	-	-	-	Skill Development	Covers the Industrial Concepts which helps the students for attaining better employment
20CY5306	Bio analytical Chemistry	Prof. Elective	3	0	0	0	3	-	-	-	Skill Development	Concepts will help in handling the instruments in the industry
20CY5307	Environmental Chemistry	Prof. Elective	3	0	0	0	3	-	-	-	Skill Development	Concepts will help in handling the chemicals & materials in the eco friendly manner.
20CY5308	Surface Analytical Techniques	Prof. Elective	3	0	0	0	3	-	-	-	Skill Development	Concepts will help in handling the instruments in the industry
20CY5309	Analysis of Food and Drugs	Prof. Elective	3	0	0	0	3	-	-	-	Skill Development	Concepts will help in handling the instruments in the industry
20CY5313	Photo Chemistry and Pericyclic reactions	Prof. Elective	3	0	0	0	3	-	-	-	Skill Development	Concepts will help in handling the instruments

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												in the industry
20CY5314	Organometallic Chemistry	Prof. Elective	3	0	0	0	3	-	-	-	Skill Development	Concepts will help in handling the instruments in the industry
20CY5315	Bio Organic Chemistry	Prof. Elective	3	0	0	0	3	-	-	-	Skill Development	Concepts will help in handling the instruments in the industry
20CY5316	Green & Sustainable Chemistry	Prof. Elective	3	0	0	0	3	-	-	-	Skill Development	Concepts will help in handling the instruments in the industry
20CY5317	Supra molecular Chemistry	Prof. Elective	3	0	0	0	3	-	**NEW**	**BOS Members**	Skill Development	Concepts will help in handling the instruments in the industry
20CY5318	Medicinal chemistry	Prof. Elective	3	0	0	0	3	-	-		Skill Development	Concepts will help in handling the instruments in the industry
20CY5404	Chromatographic Techniques & Method Validation	Prof. Elective	3	0	0	0	3	-	**Revised**	**BOS Members**	Skill Development	Concepts will help in handling the instruments in the industry
20CY5405	Classical Methods of Analysis	Prof. Elective	3	0	0	0	3	-	-	-	Skill Development	Concepts will help in handling the instruments in the industry
20CY5406	Chemo Sensors 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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20CY5410	Drug Design & Development	Prof. Elective	3	0	0	0	3	-	NEW	BOS Members	Skill Development	Concepts will help in handling the instruments in the industry
20CY5411	Chemistry of Drugs and Pharmaceuticals	Prof. Elective	3	0	0	0	3	-	-		Skill Development	Concepts will help in handling the instruments in the industry
20CY5412	Nano Chemistry	Prof. Elective	3	0	0	0	3	-	-		Skill Development	Concepts will help in handling the instruments in the industry
20UC1102	Design Thinking and Innovation - 1	Skill Development	1	0	0	4	2	-	-		Skill Development	It plays vital role towards enhancing the career prospects of the students
20UC1203	Design Thinking and Innovation - 2	Skill Development	1	0	0	4	2	20UC 1102	-		Skill Development	Covers the concepts of skills that improve visual thinking

Percentage of Syllabus Revision=(5+ 4)/40= 9/40 = 22.5%

Percentage of Courses focusing on Employability= 15/40=37.5%

Percentage of Courses focusing on Entrepreneurship= Nil

Percentage of Courses focusing on Skill Development = 25/40=62.5%

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ANNEXURE-1

Course Code	Course Name	Course Category	Existing Syllabus	New Syllabus	Topics Added/Removed/ Replaced	Change in Outcome	Justification for the Modification	*Overall Revision Percentage
20CY5103	Organic Chemistry-I	Prof. Core	Nano chemistry: Introduction, Carbon Nano tubes: Structure of single and multiwalled carbon nano tubes, synthesis –solid and gaseous carbon-based production technique, synthesis with Controlled orientation, Growth mechanism (catalyst free growth & catalyst activated growth) of carbon nano tubes, applications. Identification organic compounds: Phenol, base, organic acid, ketone, aldehyde, amide and carbohydrate with preparation of two solid derivatives	Free Radical Reactions: Introduction-types of free radical reactions and their detection. Free radical substitution-mechanism at aromatic substrates, free radical addition, free radical rearrangement. Reactivity of the attacking radicals-the effect of solvent on reactivity. Allylic halogenation (NBS)-oxidation of aldehydes to carboxylic acids-auto-oxidation, Radical coupling -arylation of aromatic compounds by diazonium salts-Sand Meyer reaction-Hunsdiecker reaction	Allylic halogenation (NBS)-oxidation of aldehydes to carboxylic acids-auto-oxidation, Radical coupling -arylation of aromatic compounds by diazonium salts-Sand Meyer reaction-Hunsdiecker reaction.	CO-4	Based on the industrial needs and recommendations of academic peers and industrial persons.	20%
20CY5202	Inorganic Chemistry-II	Prof. Core	**Metal cluster compounds -** definition – evidences for existence of M-M bonds - conditions favorable for formation of M-M bonds – preparation, structure and bonding of the following metal cluster compounds.$Re_2Cl_8^{2-}$, $Mo_2Cl_8^{4-}$, $Re_2(RCOO)_4X_2$, $Mo_2(RCOO)_4(H_2O)_2$, $(RCOO)_4(H_2O)_2$, $Cu_2(RCOO)_4$ $(H_2O)_2$, $Cr_2Cl_9^{3-}$, $Mo_2Cl_9^{3-}$, $W_2Cl_9^{3-}$, Re_3Cl_9, $Re_3Cl_{12}^{3-}$, $Mo_6Cl_8^{4+}$, $Nb_6X_{12}^{2+}$ and $Ta_6X_{12}^{2+}$. Polyatomic clusters – Zintle ions, Chevrel phases.**Organometallic compounds -** 16 and 18 electron rules. Isoelectronic relationship - Synthesis, structure, bonding and reactions of carbon monoxide, dinitrogen and nitric oxide complexes.Isolobal relationship – H, Cl, CH_3, $Mn(CO)_5$; S, CH_2, $Fe(CO)_4$; P, CH, $Co(CO)_3$Synthesis, structure, bonding and reactions of metallocenes with special reference to ferrocene**Metal Ligand**	Reactivity of coordination complexes: Kinetics of reactions – inert and labile complexes, associative, dissociative and interchange mechanisms – ligand substitution reactions in octahedral and square planar complexes, acid and base hydrolysis reactions, electron transfer reactions – inner and outer sphere electron transfer mechanisms.Metal Ligand equilibria in solution: Thermodynamics of complex formation in aqueous medium – stepwise and overall formation constants – factors affecting formation constant – determination of formation constant – chelate and macrocyclic effects; isomerism and chirality of coordination complexes – concepts of acids and bases in gas phase and effect of solvation – hard and soft acid base principle.Organometallic complexes of d-block element :16 and 18 electron rules – synthesis, structure and bonding of complexes with sigma and pi donor ligands (H^-, H_2, alkane, phosphine, N_2, CO, NO, allyl, alkene, alkyne, cyclopentadiene, benzene,	Organometallic reactions and catalysis: ligand substitution, addition and elimination reactions, migratory insertion reaction in organometallic complexes, metal-metal bonds, carbonyl and non-carbonyl clusters,isolobal analogy, application of Wade's rule, metal cluster compounds, Zintle ions, Chevrel phases. Catalysis: Homogeneous	CO-1,2,3,4	Based on the industrial needs and recommendations of academic peers and industrial persons.	80%

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			equilibria in solution Step wise and overall formation constants and their interaction – trends in stepwise constants – factors affecting the stability of metal complexes – Pearson's theory of hard and soft acids and bases (HSAB), chelate effect and its thermodynamic origin, determination of stability constants of complexes **Metal Ligand equilibria in solution:** Spectrophotometric method and pH –metric method. Reactivity of metal complexes – inert and labile complexes. Explanation of lability on the basis of valence bond and crystal field theories. **Inorganic Reaction Mechanisms** Substitution reactions of metal complexes – D, Id, Ia and A mechanisms Ligand replacement reactions of metal complexes – Acid hydrolysis – factors affecting acid hydrolysis – Anation and Base hydrolysis of Cobalt(III) complexes. Ligand displacement reactions of square planar complexes of platinum (II).**Inorganic Reaction Mechanisms** Factors affecting square planar substitution – trans effect (theories). Electron transfer reactions of complexes – concept of complementary and non-complementary reactions with examples. Inner and outer sphere mechanisms.	cyclooctatraene etc.) – carbenes, carbynes and metallocenes. Organometallic reactions and catalysis: ligand substitution, addition and elimination reactions, migratory insertion reaction in organometallic complexes, metal-metal bonds, carbonyl and non-carbonyl clusters,isolobal analogy, application of Wade's rule, metal cluster compounds, Zintle ions, Chevrel phases. Catalysis: Homogeneous (Hydrogenation, hydroformylation, acetic acid synthesis, metathesis and olefin oxidation) and heterogenous (Fischer-Tropsch reaction, Ziegler-Natta polymerization, Haber process).	(Hydrogenation, hydroformylation, acetic acid synthesis, metathesis and olefin oxidation) and heterogenous (Fischer-Tropsch reaction, Ziegler-Natta polymerization, Haber process).			
20CY 5204	Physical Chemistry-II	Prof. Core	Physical methods of molecular structural elucidation: Magnetic properties of molecules- theories of magnetic susceptibility- measurement of magnetic susceptibility. Principle and theory of NMR spectroscopy- Nature of spinning particle and its interaction with magnetic field. Chemical shift and its origin. Spin-Spin interaction-experimental methods.Application of NMR to structural elucidation- Structure of ethanol, dimethylformamide,styrene and acetophenone. Electron Spin Resonance: Principle and	Quantum Mechanics: Introduction to quantum mechanics. Schrödinger wave equation. Time-independent and time dependent Schrödinger wave equations and the relation between their solutions. Eigenfunctions and Eigenvalues. Physical Interpretation of wave function. Concepts of Operators: Laplacian, Hamiltonian, Linear and Hermition operators. Angular Momentum operators and their properties. Commutation of operators. Normalization, orthogonality and orthonormality of wave functions. Average (expectation) values. Postulates of quantum mechanics. Solutions of Schrödinger wave equation for a free particle, particle in a ring, particle in a three-dimensional box. Quantum	Types of statistics: Boltzmann, Bose-Einstein and Fermi-Dirac statistics. Thermodynamic probability (W) for the three types of statistics. Derivation of distribution laws (most probable distribution) for the three types of statistics. Lagrange's	CO-1,2,3,4	Based on the industrial needs, as per the CSIR-NET syllabus and recommendations of alumni, faculty,	80%

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			experimental technique- g-factor, line shapes and line widths- hyperfine interactions-applications of ESR studies to the structure of free radicals, metal complexes and biological systems.Electrochemistry I: Electrochemical cell- Galvanic and electrolytic cell. Concentration cell with and without transference- effect of complexation on redox potential- ferricyanide/ferrocyanide couple, Iron(III) phenonthroline/ Iron(II) phenonthroline couple. Determination of standard potential. Activity coefficient from EMF data. Primary and secondary cells, batteries examples. Fuel cells. The electrode-electrolyte interface. The electrical double layer. The Helmholtz-Perrin parallel-plate model, the Gouy-Chapman diffuse-charge model and the Stern model. Electrodics: Charge transfer reactions at the electrode-electrolyte interface. Exchange current density and overpotential. Derivation of Butler-Volmer equation. High field approximation, Tafel equation, Low field equilibrium, Nernest equation. Voltametry-Concentration polarization, experimental techniques.	mechanical degeneracy, tunneling (no derivation). Application of Schrödinger equation to harmonic oscillator, rigid rotator. Eigenfunctions and eigenvalues of angular momentum. Ladder operator method for angular momentum. Surface phenomena :Types of adsorption isotherms, Effect of temperature on adsorption, Mechanical adsorption, Estimation of surface area using BET equation, Gibbs adsorption isotherm and its significance, Surface tension and surface energy, Pressure difference across curved surface (Laplace equation), Vapour pressure of droplets (Kelvin equation), Surface film on liquids (electro-kinetic phenomena), Catalytic activity of surfaces Electrochemistry: Activity coefficients and ion-ion interactions. Physical significance of activity coefficients, mean activity coefficient of an electrolyte and its determination. Derivation of the Debye-Hückel theory of activity coefficients The electrode-electrolyte interface. The electrical double layer. The Helmholtz-Perrin parallel-plate model, the Gouy-Chapman diffuse-charge model and the Stern model. Electrodics: Charge transfer reactions at the electrode-electrolyte interface. Exchange current density and overpotential. Derivation of Butler-Volmer equation. High field approximation, Tafel equation, Low field equilibrium, Nernest equation. Voltametry-Concentration polarization, experimental techniques.Statistical Thermodynamics: Fundamentals: Idea of microstates and macrostates. Concept of distributions- Binomial & multi-nomial distributions for non-degenerate and degenerate systems, Thermodynamic probability and most probable distribution. Canonical and other ensembles. Statistical mechanics for systems of independent particles and its importance in chemistry. Types of statistics: Boltzmann, Bose-Einstein and Fermi-Dirac statistics. Thermodynamic probability (W) for the three types of statistics. Derivation of distribution laws (most probable distribution) for the three types of statistics. Lagrange's undetermined multipliers. Stirling's approximation, Molecular partition function and its importance. Assembly partition function.	undetermined multipliers. Stirling's approximation, Molecular partition function and its importance. Assembly partition function.		academic peers and industrial persons.	
20C	Separat	Prof. electi	**Inorganic molecular sieves:** structure of zeolites, crystals, types of sieves,	**Chromatography:** classification of different chromatographic methods, methods of development-	**Gel Exclusion chromatography**	CO-2,3	Based on the	50%

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Y530 4	ion Techni ques	ve	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.	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. **Paper chromatography:** principle, papers as a chromatographic medium, modified papers, solvent systems, mechanism of paper chromatography, experimental technique, different development methods-ascending, descending, horizontal, circular spreading, multiple development, two dimensional development, reverse phase paper chromatographic technique-visualization and evaluation of chromatograms, applications. **Thin layer chromatography:** principle, chromatographic media-coating materials, applications, activation of adsorbent, sample development, solvent systems, development of chromatoplate, types of development, visualization methods, documentation, applications in the separation, HPTLC-principle, technique, applications. **Capillary Electrophoresis:** Principle, Details of the Instrument, Applications to Inorganic and Organic compounds. **Ion Exchange:** principles of ion-exchange systems, synthetic ion-exchange resins, properties of anion and cation exchange resins, ion-exchange mechanism, ion-exchange equilibria, selectivity, ion-exchange capacity, applications of ion-exchangers in different fields. **Ion exchange chromatography:** Principle, Equipment, Application Specifically Separations of Lanthanides, Actinides, amino acids. **Ion chromatography:** principles of separation, instrumentation, detectors,	**or Gel filtration chromatography:** principles, properties of xerogels, apparatus and detectors, resolution of gel type, applications to organic compounds.		industrial needs and recommendations of academic peers and industrial persons.	

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				separation of cations and anions, applications in the analysis of water and air pollutants. **Solvent Extraction:** principles and processes of solvent extraction, Distribution Law and Partition coefficient, nature of partition forces, different types of solvent extraction systems Batch extraction, Continuous extraction, Counter current extraction, solvent extraction systems, applications in metallurgy, general applications in analysis and pre-concentration, special extraction systems like crown ethers, super fluid and surfactant extractions-examples. **Gel Exclusion chromatography or Gel filtration chromatography:** principles, properties of xerogels, apparatus and detectors, resolution of gel type, applications to organic compounds.				

ANNEXURE 2

S. No.	Course Code	Name of the Course	L	T	P	S	Credits	New Course/Revised Course/ Retained Course	Changes Proposed By	Employability / Entrepreneurship / Skill Development	Justification
1	20UC1101	Design Thinking and Innovation -II	1	0	0	4	2	Added Course	Student	Skill Development	It plays vital role towards enhancing the career prospects of the students
2	20UC1203	Design Thinking and Innovation II	1	0	0	4	2	Added Course	Student	Skill Development	Covers the concepts of skills that improve visual thinking

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ANNEXURE-3

Course Code: 20CY5101 **Course Name:** Theoretical Chemistry-I

L-T-P-S: 4-0-0-0 **Credits**: 4 **Prerequisite:** NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Describe symmetry elements, operations, and groups by representing them in matrices	1,2	3
CO2	Employ the basic principles of Electronic Spectroscopy & Molecular Spectroscopy	3	3
CO3	Employ the basic principles of Infrared spectroscopy	1,2	3
CO4	Employ the basic principles of Raman spectroscopy	1,2	3

Syllabus: Symmetry and Group theory in Chemistry: Symmetry elements & operations, group, subgroup, relation between order of a finite group and its subgroup. Point group of symmetry. Schonfiles symbols, representation of groups by Matrices (representation for Cn, Cnv, Cnh, Dn etc. groups to be worked out, explicitly). Character of a representation. The great orthogonality theorem (without proof) and its importance. Character tables and their use, Application of group theory in IR and Raman spectroscopy Electronic Spectroscopy & Molecular Spectroscopy: Introduction to spectroscopy-Classification based on absorption-Emission-Importance- Characterization of electromagnetic radiation -Beer-Lambert's law-deviations from Beers law-Instrumentation-Applications-Energy levels, molecular orbital's, vibronic transition, vibrational progressions and geometry of the excited sates, Franck-Condon principle. Emission spectra; radioactive and non-radioactive decay, internal conversion, spectra of transition metal complexes, charge-transfer spectra Infrared spectroscopy: Basics of IR spectroscopy- Units of frequency wavelength- wave number-molecular vibrations-factors influencing vibrational frequencies-IR spectrometer, characterization techniques. Harmonic oscillator, vibrational energies of diatomic molecules, zero-point energy, force constant and bond strengths, anhoremonicity Morse potential energy diagram. PQR braches, Born – oppenheimer approximation, selection rules, overtones, hot bands Application Raman spectroscopy: Introduction –Principle-Classical and quantum theories of Raman effects, pure rotational, vibrational and Vibrational – rotational Raman spectra, selection rules, mutual exclusion principle, Resonance Raman spectroscopy, coherent antistrokes Raman Spectroscopy (CARS)-Application. Mass spectrometry: Basic Principles: instrumentation: mass spectrometer, isotope abundances; the molecular ion, metastable ions-Fragmentation of small molecules. Mossbauer Spectroscopy: Principle, Experimental Considerations and Presentation of the Spectrum - Isomer Shifts – Quadrupole splitting and Magnetic hyperfine splitting Selection Rules. Applications-Iron Compounds: Low-spin and High spin Fe(II) and Fe(III) Complexes - π-bonding Effects in Iron complexes - Diamagnetic and Covalent Compounds-Iodine Compounds: Isomer Shifts of I127 and I129 – Applications to Alkali metal iodides and Molecular Iodine.

Textbooks:

1. Introductory Group Theory for Chemists – George Davidson
2. Group theory for chemistry – A. K. Bhattacharya
3. Molecular spectroscopy by B. K. Sharma

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4. Vibrational Spectroscopy by D. N. Sathyanarayana New Age Int. Pub. Spectroscopy by Aruldas.

Reference Books:

1. Chemical Analysis by H. A. Laitinan and W. E. Harris, McGraw Hill.
2. Symmetry and Spectroscopy of Molecules- K. Veera Reddy, New Age International Limited Publishers.
3. Fundamentals of Molecular spectroscopy: by C. N. Banwell

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Course Code: 20CY5201 **Course Name:** Theoretical Chemistry-II

L-T-P-S: 4-0-0-0 **Credits**: 4 **Prerequisite:** NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Demonstrate various molecular spectroscopic terms with their theoretical background	1,2	3
CO2	Employ Nuclear magnetic resonance spectroscopy to interpret organic molecules	3	3
CO3	Employ the basic principles of Electron Spin Resonance (ESR)-Spectroscopy and XRD applications	1,2	3
CO4	Write a small computer code to solve basic chemistry problems	1,2	3

Syllabus: Motion of molecules-Degrees of freedom -Energy associates with the degrees of freedom Type of spectra- Microwave spectroscopy. –Principle-Classification molecules, rigid rotator model, effect of isotopic substitution on transition frequencies, Intensities non-rigid rotator-Microwave spectra of polyatomic molecules. Photoelectron Spectroscopy: Basic principles; photo-electric effect, ionization process, Koopman's theorem. Photoelectron spectra of simple molecules, Electron spin chemical analysis (ESCA), chemical information from ESCA, Auger electron spectroscopy Nuclear Magnetic Resonance Spectroscopy: (Proton and Carbon -13 NMR). Introduction-Principle of NMR-Classical and quantum approach-nuclear spin, nuclear resonance-Chemically & Magnetically equivalence and Nonequivalence protons-The measurement of spectra: Chemical shift: the intensity of NMR signals and integration factors affecting the chemical shifts: shielding-deshielding, spin-spin coupling, (n+1) rule, Pascals triangle, coupling constant, 13C NMR, chemical equivalent and non-equivalent carbons, chemical shift, Applications. Electron Spin Resonance (ESR)-Spectroscopy- Theory-Instrumentation-ESR lines and intensity-g-values -factors affecting the ESR lines- Hyperfine interactions. Zero field splitting and Kramer's degeneracy. Applications of ESR for the characterization of free radicals and metal compounds. X-ray diffraction-Introduction- Instrumentation-principle-Braggs law-Scherrer Formula-Applications. Laser spectroscopy- General principles of laser action, features of lasers and population inversion. Examples of some common lasers –solid state, gas and dye lasers. Computer applications in chemistry-Importance of Coding-Developing of small computer codes using any one of the languages FORTRAN/C/BASIC involving simple formulae in Chemistry, such as Van der Waals equation. Rate constant, Radioactive decay (Half Life), Normality, Molarity and Morality of solutions, Nernst Equation, pH-equation.

Textbooks:

1) Fundamentals of molecular Spectroscopy by 3rd ed., TMH, New Delhi, 1983.
2) Spectroscopy by B.P. Straughan and S. Walker, Vol.3, Chapman Hall, London, 1976.
3) Introduction to Molecular Spectroscopy by G.M. Barrow, McGraw Hill, New York, 1964.
4) Introduction to Photoelectron Spectroscopy by P. K. Ghosh, John Wiley New York, 1989.
5) Spectroscopic Identification of Organic Compounds by P.M. Silverstein, F. X. Wester, 6th ed., Wiley 1998.

Reference Books:

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1) Organic Spectroscopy by W. Kemp, 3rd Ed., Mac Millon, 1994.
2) Applications of Absorption Spectroscopy of Organic Compounds by J.R. Dyer, Prentice Hall, 1965.
3) Introductory Group Theory for Chemists – George Davidson VOGEL'S (2009) Textbook of Quantitative Chemical Analysis- Pearson, 6th Edin.
4) Basics of computers for Chemists, P. C. Jurs.

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Course Code: 20CY5317 **Course Name:** Supramolecular Chemistry

L-T-P-S: 3-0-0-0 **Credits**: 3 **Prerequisite:** NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Explain concepts, properties, and reactions of supra molecular chemistry.	2,3	3
CO2	Cation-binding hosts and binding of anions and neutral molecules.	1,4	3
CO3	Apply the supra molecular chemistry in biology	2,4	3
CO4	Apply the supra molecular chemistry in Chemistry	1,2,5	3

Syllabus: Concepts of Supramolecular Chemistry: Definition: From molecular to Supramolecular. Nature of supramolecular interactions (hydrogen bonding, metal coordination, hydrophobic forces, van der Waals forces, pi–pi interactions and electrostatic effects). Host-guest interaction. Molecular recognition. Types of recognition. Self-assembly in biological systems (including DNA and enzymes) Cation-binding Hosts: Concepts: Macrocyclic and template effects. Cation receptors: Crown ethers, Cryptands, Spherands, Calixarens. Selectivity of cation complexation. Binding of Anions and Neutral molecules: Concepts, Anion host design, Anion receptors. Shape and selectivity, Neutral receptors, clathrates, cavitands, cyclodextrins, cyclophanes. Applications of Supramolecular Chemistry in Biology: Biological mimics, Metalloproteins, Membrane transport, Ionophores, Heme analogues, Photosynthesis, Oxygen transport, Metalloenzymes Other applications of Supramolecular Chemistry: Supramolecular reactivity and catalysis, Supramolecular devices and sensors, Nanoscience applications, Drug delivery and sensing.

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.

Reference Books:

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.

14/6/2022

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Course Code: 20CY5406 **Course Name:** Chemo Sensors and Body Fluid Analysis

L-T-P-S: 3-0-0-0 **Credits**: 3 **Prerequisite:** NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Understand the principles of various chemical sensors	2,3	3
CO2	Analysis of biomolecules in body fluids	1,2,3	3
CO3	Employ analytical techniques in the determination of vitamins	2,3,6	3
CO4	Apply Immunoanalytical Techniques in clinical analysis	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 acostic 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, Photo fluorometric 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.

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

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Reference Books:

1. Analytical Chemistry, Ed. by Kellner, Mermet, otto, Valcarcel, Widmer, Second Ed. Wiley –VCH
2. Practical Clinical Biochemistry by Gowenlock, CBS published, 6th Ed.

24/6/2020

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Course Code: 20CY5410 **Course Name:** Drug Design & Development

L-T-P-S: 3-0-0-0 **Credits**: 3 **Prerequisite:** NIL

CO#	Course Outcome (CO)	PO	BTL
CO1	Outline the synthesis and properties of antibiotics.	2,3	3
CO2	Describe the psycho active drugs and their synthesis along with properties.	1,3	3
CO3	Exposed to drug design and its tools	1,2,3	3
CO4	Describe the QSAR Studies	1,2,4,5	3

Syllabus: Antibiotics: β-lactam rings, antibiotics inhibiting protein synthesis. Synthesis of penicillin G, penicllin V, amoxicillin, cephalosporin, tetracycline. Local Anti-infective Drugs Introduction and general mode of action. Synthesis of sulphonamides,furazolidone, ciprofloxacin, norfloxacin, dapsone, amino Salicylic acid, ethionamie, flucanazole, griseofulvin, chloroquin and pramaquin. Psychoactive Drug: Introduction, neurotransmitters, NA Dopamine, 5HT, acetylcholine, GABA, Histamine, serotonin, CNS depressants, general anaesthetics, mode of action of hypnotics, sedatives, anti-anxiety drugs, benzodiazipinene, neurochemistry of mental diseases. Antipsychotic drugs-neuroleptics, antidepressants, butyrophenones. Synthesis of diazepam, oxazepam, phenytoin, barbiturates, thiopental sodium, glutethimide. Drug Design: Development of new drugs, procedures followed in drug design, concept of lead compound and lead modification, concepts of prodrugs and soft drugs, structure- activity relationship (SAR). Theories of drug activity: occupancy theory, rate theory, induced theory, Quantitative structure activity relationship. History and development of QSAR. Concepts of drug receptors. Elementary treatment of drug receptor interactions. physicochemical parameters: lipophilicity, partition coefficient, electronic ionization constant, steric, Shelton and surface activity parameters and redox potentials. Free-Wilson analysis, Hansch analysis, relationship between Free-Wilson and Hansch analysis. LD-50, ED-50 (mathematical derivation of equations excluded).

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.
4. Exploring QSAR: Fundamentals and applications in Chemistry and Biology, Vol-I, by corwin hasch, Albert lio and David Hoekman, ACS Professional Reference books.

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05-06-2020

DEPARTMENT OF CHEMISTRY

Department Academic Committee (DAC)

Minutes of Meeting, A.Y. 2020-21

The 5th DAC meeting was conducted in HOD chemistry chamber on 5th June 2020 at 10.00 AM.

Agenda: To introduce new elective papers i.e., Supramolecular Chemistry and Drug design in place of Food Chemistry and Advanced Organic spectroscopy respectively.

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. Naresh Varma	Assistant Professor & PG Coordinator
4	Dr. Pradeep Kumar Brahman	Assistant Professor
5	Dr. A. Venkateswara Rao	Assistant Professor & Professor in Charge
6	Mr. Dasari Shanmukha Sai	M. Sc Student
7.	Mr. G. Tejaswi	M. Sc Student

The following points were discussed and resolved:

1. To meet the research and industrial requirements the foresaid courses need to be incorporated in the coming BoS meeting.
2. Minor changes identified in the first-year courses are to be incorporated in the coming BoS meeting.

24/6/2020

Head of the Department

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Therefore, the minutes of the 5th Department Academic Committee meeting held on 5th June 2020 at 10:00 AM 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. Naresh Varma	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. Dasari. Shanmukha Sai	M. Sc Student	
7.	Ms. G. Tejaswi	M. Sc Student	

Head of the Department

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