RAJAH SERFOJI GOVERNMENT COLLEGE
(AUTONOMOUS)
THANJAVUR – 613 005

PG & RESEARCH DEPARTMENT OF CHEMISTRY

SYLLABUS FOR
M.Phil. Programme in Chemistry

LOCF WITH CHOICE BASED CREDIT SYSTEM

Effective from the Academic Year 2022-2023

RAJAH SERFOJI GOVT. COLLEGE (A) - THANJAVUR - 05.

DEPARTMENT OF CHEMISTRY

BOARD OF STUDIES MEETING - 2022 REVIEW MEETING

DATE : 18.08.2022 TIME: 11.30 AM

PLACE : CHEMISTRY STAFF ROOM

The board of studies meeting in chemistry was held on 18.8.2022. A detailed discussion was held on the curriculum structure and the syllabi for B.Sc, M.Sc and M.phil chemistry. The board suggested valuable and appropriate modifications based on the premises of UGC-CBCS and LOCF.

After the detailed discussion the following resolutions were passed by the Board of Studies.

i) Resolved to approve the curriculum structure and the syllabi framed on the premises of UGC-CBCS and LOCF for B.Sc, M.Sc and M.Phil courses from the academic year 2022-2023.

ii) Resolved to add two Generic Elective papers in the curiculum structure and syllabus to the PG programme (Food and Adulterants) as per the UGC-CBCS and LOCF structure.

iii) Resolved to offer value added, and add on courses to UG and PG programs under credit accumulation system. Students can also do these courses through online platforms like SWAYAM and MOOCS.

iv) Resolved to include Internship, mini / Group projects in order to enhance students practical knowledge and Employability skills.

MEMBERS PRESENT

1. Prof. S.P. ELANGOVAN — CHAIRMAN
   ASSOCIATE PROFESSOR & HEAD
   DEPT. OF CHEMISTRY, RSGC-TNJ-05
   18/8/2022

2. DR. A. ILLANGOVAN — UNIVERSITY NOMINEE
   PROFESSOR,
   DEPARTMENT OF CHEMISTRY
   BHARATHIDASAN UNIVERSITY,
   TRICHIRAPPALLI - 24
   18.8.2022

3. Dr. K. KRISHNASAMY — SUBJECT EXPERT-I
   PROFESSOR OF CHEMISTRY
   DEPT. OF CHEMISTRY, ANNAMALAI UNIVERSITY
   CHIDAMBARAM.
   18/8/2022

4. Dr. R. THIRUNEELAKANDAN — SUBJECT EXPERT-II
   PROFESSOR OF CHEMISTRY
   DEPT. OF CHEMISTRY
   ANNA UNIVERSITY, BIT CAMPUS
   TRICHY-24.
   18/8/22.

5. Mr. SEKAR GANESAN — INDUSTRIALIST
   HEAD - SOUTH INDIA OPERATIONS
   BASF INDIA LTD - CHENNAI - 04

6. Dr. M. PUGAZHENTHI — ALUMNUS
   ASSISTANT PROFESSOR
   AVVM SRI PUSHPAM COLLEGE (A)
   POONDI - 05, THANJAVUR
   18/8/22

7. Dr. J. GNANASUNDARAM — MEMBER
   ASST. PROFESSOR OF CHEMISTRY
   DEPT. OF CHEMISTRY
   RSGC-TNJ.
   18.8.22

8. Dr. K. RAJARAJAN
   ASST. PROFESSOR OF CHEMISTRY
   18/8/22

9. Dr. N. INGARSAN — MEMBER
ASST. PROFESSOR OF CHEMISTRY — DEPT. OF CHEMISTRY RSGC-TNJ — 18/08/22

10. Prof. N. PUNITHA
ASST. PROFESSOR OF CHEMISTRY — " — 18/8/22

11. Prof. M. ANITHA
ASST. PROFESSOR OF CHEMISTRY — " — 18/8/22

12. Dr. P. SANGEETHA
ASST. PROFESSOR OF CHEMISTRY — " — 18/8/22

13. Prof. M. MANGALAM
ASST. PROFESSOR OF CHEMISTRY — " — 18/8/22

14. Prof. N. VIDHYUAATHA
ASST. PROFESSOR OF CHEMISTRY — " — 18/8/22

15. Prof. K. VIJAYALAKSHMI
ASST. PROFESSOR OF CHEMISTRY — " — 18/8/22

16. Dr. R. CHITHIRAVEL
ASST. PROFESSOR OF CHEMISTRY — " — 18/08/22

17. Dr. G. MANIMEGALAI
ASST. PROFESSOR OF CHEMISTRY — " — 18/8/22

18. Dr. C. KATHIRAVAN
ASST. PROFESSOR OF CHEMISTRY — " — 18/08/22

19. Prof. R. RADHAKRISHNAN
ASST. PROFESSOR OF CHEMISTRY — " — 18.8.22

20. Dr. D. ILANGESWARAN
ASST. PROFESSOR OF CHEMISTRY — " — 18/8/22

21. Dr. S. SELVAKUMAR
ASST. PROFESSOR OF CHEMISTRY — " — 18/08/22

22	Prof. R. BALAJI ASST. PROFESSOR OF CHEMISTRY	MEMBER DEPT. OF CHEMISTRY RSGC-TNJ 18/8/22
23	Prof. A. SIVAKUMAR ASST. PROFESSOR OF CHEMISTRY	〃 18/8/22
24	Dr. T. RAJKUMAR ASST. PROFESSOR OF CHEMISTRY	〃
25.	Dr. S. LAWRENCE ASST. PROFESSOR OF CHEMISTRY	〃 18/08/22
26.	Dr. J. ELANGOVAN ASST. PROFESSOR OF CHEMISTRY	〃 18/8/22
27.	Dr. M. ELAMARAN ASST. PROFESSOR OF CHEMISTRY	〃 18/8/22

Rajah Serfoji Government College (Autonomous), Thanjavur – 613 005.

Circular

With reference to the Bharathidasan University letter Bharathidasan University letter No.51812/R/CCCD/L/2021 Dated16.02.2021 the following members of the Board of Studies of respective departments are nominated /to be nominated for the period from **04.02.2021 to 03.02.2024 (Three Years)**

Department of Chemistry

1	University Representative Nominee (Appointed by University)	Dr.A.Ilangovan Professor Department of Chemistry Bharathidasan University Tiruchirappalli - 620 024
2	**Two** Subject experts from outside of the college	a) Dr. K. Krishnasamy Professor of Chemistry Dept. of Chemistry Annamalai University Annamalai Nagar Chidambaram Mobile:99425 47856 b)Dr. R. Thiruneelakandan Professor of Chemistry Dept. of Chemistry University College of Engineering Anna University BIT Campus Trichy - 621 0024 Mobile:94430 92608
3	One representative from Industry/Corporate relating to placement	Mr.Sekar Ganesan Head - South India Operations BASF India Ltd. World No.1 Chemical Industry Chennai - 603 204 Mobile:99625 46541
4	One PG Meritorious alumnus	Dr.M.Pugazhenthi Assistant Professor Department of Chemistry AVVM Sri Pushpam College (Autonomous) Poondi - 613 503 Thanjavur Mobile:95664 22712

18.8.2022

18/8/2022

18/8/22

18/8/22

PRINCIPAL
PRINCIPAL
Rajah Serfoji Govt. College (Autonomous)
THANJAVUR-613 005.

Note: Copy of this letter will be given to HOD for file after getting approval from the Principal

PROGRAMME OBJECTIVES (POs)

On Completion of the programme, the scholars will have the capacity to

PO1	motivate themselves and develop an interest in planning and implementation of research.
PO2	handle equipments needed for material preparation, characterization and to analyze and interpret the data with theoretical background and software.
PO3	practice the teaching-learning process by being the proponent in classroom and laboratory experience.
PO4	apply the scientific context to develop innovative ideas, products and methods and Adopt changes in the environment with high integrity and transpire ethical professionals.
PO5	recognize and integrate life-long learning skills to become pro-active in personal and professional live.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

After Completion of the programme, the scholars will have the capacity to

PSO1	impart research knowledge in advanced concepts and its applications in various fields and to develop capability in organizing and presenting the acquired knowledge in written discourse.
PSO2	develop the critical analysis and problem-solving skills and to gain versatile knowledge about the use of computers and available software in chemistry.
PSO3	attain complete knowledge about the basics of characterization Techniques and to acquire knowledge about chemistry of heterocyclic, organic reaction mechanism , crystal growth, deep eutectic solvent system and reaction kinetics.
PSO4	apply the spectroscopic and chromatographic techniques and to learn how to interpret the data for well-known compounds, which are helpful to predict the unknown molecules.
PSO5	design their own research project based on their firm theoretical understanding and to get sufficient expertise in the operational knowledge and laboratory skills in all major fields of chemistry.

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
M.Phil, Chemistry –LOCF with CBCS Pattern
(For the Candidates admitted from the academic year 2022 -2023 onwards)

PART	CODE	COURSE	TITLE	MARKS		TOTAL	EXAM HOURS	CREDIT	PAGE NOS.
			I SEMESTER	IA	WE				
III	A1MCH1	CC1	Research Methodology	25	75	100	3	4	4
III	A1MCH2	CC2	Physical Methods in Chemistry	25	75	100	3	4	7
III	A1MPTL3	CC3	Teaching and Learning Skills	25	75	100	3	4	11
III	A1MCH4A	CC4	1. Principles and advances in medicinal chemistry	25	75	100	3	4	14
	A1MCH4B		2. Synthetic chemistry						16
	A1MCH4C		4. Organic Reaction Mechanism						19
	A1MCH4D		5. Chemistry of polymers and Deep Eutectic solvents						21
	A1MCH4E		7. Crystal Growth and Nonlinear Optics						25
		TOTAL				**400**		**16**	28
			II SEMESTER						
				V.V	**Dis.**	**Total**			
III	A2MCHD	CC5	Dissertation and viva Voce	50	150	200		8	
		GRAND TOTAL				**600**		**24**	

No. of papers

Core Courses	-	**4 (each of 4 credits)**
Project	-	**1 (8 credits)**
Total	-	**5 (24 credits)**

Separate passing minimum is prescribed for Internal and External

a). The passing minimum for CIA shall be 40% out of 25 Marks. (i.e., 10 Marks)
b). The passing minimum for Autonomous Examinations shall be 40% out 75Marks. (i.e. 30 Marks)
c). The passing minimum not Less than 50% in the aggregate

Semester	Code	Course	Title of the Paper	Hours/Week	Credits	Medium
I	A1MCH1	CC-I	Research Methodology	4	4	English

Course Objectives

- To impart knowledge on research methodology
- To gain the depth information of statistical analysis.
- To know the various spectroscopic methods.
- To gain the knowledge about different chromatographic techniques.
- To understand the deep sense about electro analytical techniques.

Course Outcomes (CO)

On successful completion of the course, scholars will be able to

CO No	CO-Statements
CO1	gain the versatile knowledge about different types of literature search and indexes and to know about the preparation and presentation of reports.
CO2	acquire problem solving capacity, interpretation of results with the use of error analysis, correlation methods and computer application.
CO3	report and discuss the principles and applications of X-ray spectroscopy, Molecular luminescence, Fluorometry and phosphorimetry.
CO4	understand the basic principles and applications of chromatography and electrophoresis.
CO5	attain in-depth knowledge about polorography, amperometric titrations and ion selective electrodes.

UNIT I

Literature Survey

Source of information: primary, secondary and tertiary – sources: Journals, Abstracts, Current Tiles, Reviews, Monographs and Dictionaries – Information retrievals: using internet and other electronic Medias (preparing a review article related to problem of research of the student) E journals and data bases – search engines: Google and Yahoo search and Wikipedia. Reports and research work – laboratory observation – preparation of records and manuscripts – Research paper formats in Indian Journal of Chemistry, Journal of Indian Chemical Society, Journal of American Chemical Society, Tetrahedron Letters, Journal of Chemical Education, etc., - Writing of the project reports of thesis – IUPAC nomenclature of organic & inorganic Compounds.

UNIT II

Error Analysis

Types of Error – Accuracy, precision, significant figures, use of calculus in the estimation of errors – Frequency distributions, the binomial distribution, the Poisson distribution and normal distribution – Describing Data, population and sample, mean, variance, standard deviation, way of quoting uncertainty, robust estimators, repeatability and reproducibility of measurements – Hypothesis testing, levels of confidence and significance, test for an outlier, testing variances, means t-Test, Paired t-Test – Analysis of variance (ANOVA) – Correlation and Regression– Curve fitting, Fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals – General polynomial equation fitting, linear zing transformations, exponential function fit – r and its abuse – Multiple linear regression analysis, elementary aspects – Applications of some computer packages like MS-Excel, Origin.

UNIT III

X-ray Spectroscopy

Introduction, Mosley's law, X-ray instrumentation, X-ray absorption X-ray emission methods, X-ray emission vs X-ray absorption, X-ray diffraction, Bragg's law. Automated X-ray diffractometry, Determination of crystal structure, Interpretation of X-ray diffraction pattern, Applications.

Molecular luminescence, Fluorometry and phosphorimetry

Introduction, Principles of fluorescence phosphorescence, Interpretation of fluorescence spectra, Factors, fluorescence intensity and concentration, instrumentation for flouorometry, Types of filter flouorometry, Reporting fluorescence spectra, Applications of flouorometry – Some special determinations.

UNIT IV

Chromatography and Separation Techniques

Solvent extraction – Principles of ion exchange, paper, thin layer and column chromatography – Gas Chromatography techniques – Columns, adsorbents ,methods, Rf values, McReynold's constants and their uses – HPTLC, HPLC techniques – Adsorbents, columns, detection methods, estimations, preparative column – GC-MS techniques: methods, principles and uses. Electrophoresis: Principles, factors affecting ionic migration – Effect of pH and ionic strength – Gel electrophoresis.

UNIT V

Electro analytical Techniques

Voltammetry – Polarography – Principles and introduction, Current – voltage relationship, Polarogram interpretation. Half wave potential, Reversible and Irreversible waves – residual, Migration and Diffusion currents, the Dropping Mercury Electrode (DME), Advantages of DME – Advantages and Applications of polarography. Amperometric Titrations – Principles, Titrations with two indicators – Instrumentation, Titration procedure, Advantages and Disadvantages, Applications. Ion selective electrodes – Glass – Membrane, Liquid – Membrane, Solid state Membrane, and their applications

References

UNIT I

1. http://www.virtualref.com/govdocs/s189.htm 2. http://www.inflibnet.ac.in
3. http://www.springerlink.com 4. http://rsc.org 5. http://www.pubs.acs.org
6. http://dspace.org 7. http://dspace.bdu.ac.in

UNIT II

1. D. B. Hibbert and J. J. Gooding, Data Analysis for Chemistry, Oxford University Press, 2006.
2. J. Topping, Errors of Observation and Their Treatment, Fourth Edn.,Chapman Hall, London, 1984.
3. S. C. Gupta, Fundamentals of Statistics, Sixth Edn., Himalaya Publ. House,Delhi, 2006.
4. H. E. Solbers, Inaccuracies in Computer Calculation of Standard Deviation,Anal. Chem. 55, 1611 (1983).
5. P. M. Wanek et al., Inaccuracies in the Calculation of Standard Deviation with Electronic Calculators, Anal. Chem. 54, 1877 (1982).

UNIT III

1. A. Sharma, S. G. Schulman, Introduction to Fluorescence Spectroscopy, Wiley-Interscience,New York, 1999.
2. F. Rouessac and A. Rouessac, Chemical Analysis, John Wiley and Sons,Chichester, 2000.
3. C. N. Banwell and E. M. McCash, Fundamentals of Molecular Spectroscopy,4th edn., Tata McGraw-Hill, New Delhi, 1994.
4. Nicolo Omemetto, Analytical Laser Spectroscopy, Vol.50, John-Wiley and Sons, New York, 1979

UNIT IV

1. R. Stock and C. B. F. Rice, Chromatographic Methods, Chapman and Hall,New York. , 1963
2. B. S. Furniss, A. J. Hannaford, P. W. G. Smith, a. R. Tatchell, Vogel's TextBook of Practical Organic Chemistry, 5th Edition, Pearson, New Delhi, 1989
3. V. K. Srivastava and K. K. Srivastava, Introduction to Chromatography, S.Chand & Co., New Delhi, 2nd edition, 1981.

UNIT V

1. C. H. Hamann, A. Hamnett and W. Vilelstich, Electrochemistry, Wiley-VCH, 1998.
2. A. J. Bard and L. F. Faulkner, Electrochemical methods – Fundamentals and Applications, 2nd Edn., Wiley-VCH, 1998.

3. A. C. Fisher, Electrode Dynamics, Oxford University Press, 1996.
4. J. Koryta and K. Stulik, Ion-Selective Electrodes, Cambridge University Press, 1983.
5. J. Janata, Principles of Chemical Sensors, Plenum Press, New York, 1989.

Relationship matrix for Course outcomes,Programme outcomes/Programme specific outcomes

Course outcomes	Programme outcomes(PO)					Programme specific outcomes(PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	2	2	1	3	2	3	2	3	2.4
CO2	3	2	2	2	2	2	3	2	2	2	2.2
CO3	2	2	3	2	3	2	2	2	3	2	2.3
CO4	2	3	2	2	2	2	3	1	2	3	2.2
CO5	2	2	3	2	2	2	2	2	3	2	2.2
Mean overall Score											2.26(High)

Question Paper Pattern

Maximum Marks: 75 **Exam duration: Three Hours**

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either or type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

HEAD OF THE DEPARTMENT OF CHEMISTR
RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR - 613 005

Semester	Code	Course	Title of the Paper	Hours/Week	Credits	Medium
I	A1MCH2	CC-2	Physical Methods in Chemistry	4	4	English

Course Objectives

- To understand the principles of NMR spectroscopy
- To apply the NMR technique for the quantitative and structural analysis of chemical compounds.
- To know the deep information of NQR and Mossbauer spectroscopy.
- To recollect the fundamentals and application of ESR spectroscopy.
- To study the applications of EPR Spectroscopy.

Course Outcomes (CO)

On successful completion of the course, scholars will be able to

CO No.	CO-Statements
CO1	understand principles and applications of NMR spectroscopy for ^{1}H,^{19}F,^{31}P & ^{13}C
CO2	Obtain the deep knowledge about first order and second order coupling constant and to apply the proton NMR in MRI.
CO3	Acquire the deep sense about the characteristics of quadrupolar nuclei using NQR spectroscopy and to know the principles and applications of Mossbauer spectroscopy.
CO4	Get a thorough knowledge about ESR spectroscopy includes Double resonance, CINDNP and CIDEP techniques.
CO5	Attain in-depth knowledge about the applications of EPR spectroscopy to various inorganic compounds and metallobiomolecules.

UNIT I

NMR Spectroscopy: Principles

Definition of nuclear angular momentum and the nuclear magnetic moment Idea about the rotating axis system – Bloch equations – Quantum mechanical description of the NMR experiment, transition probabilities – Relaxation effects – Fourier transform NMR – Measurement of T_1 and T_2 - Effect of quadrupolar nuclei evaluation of thermodynamic and kinetic data using NMR techniques – Second order spectra – Quantum mechanical treatment of coupling effects of relative magnitudes of J on the spectrum of an AB molecule - Spectral simplification and determination of signs of coupling constants. Systems with chemical exchange – Evaluation of thermodynamic parameters in simple systems – Study of fluxional behaviour of molecules an elementary treatment of second order spectra – examples.

NMR Spectroscopy: Applications to Inorganic Systems ^{1}H,^{19}F,^{31}P,^{13}C – Applications in probing inorganic structures, study of fluxional behavior in organometallics, evaluation of thermodynamic parameters – NMR of paramagnetic molecules – isotropic shifts – Contact and pseudo-contact shifts – Lanthanide shift reagents.

UNIT II

NMR Spectroscopy: Proton and Carbon NMR

Examples for different spin systems – Chemical shifts and coupling constants (Spin-spin coupling) involving different nuclei (1H, 19F, 31P, 13C) – interpretation and applications to inorganic compounds – Effect of quadrupole nuclei (^{2}H, ^{10}B, ^{11}B) on the proton NMR spectra – Satellite spectra.

^{1}H NMR Spectroscopy – Coupling constant – First order and second order splitting – Spin-spin splitting – Dependence of J on dihedral angle – Vicinal and geminal coupling constants – Karplus equation – Long range coupling constants - Influence of stereochemical factors on chemical shift of protons – Simplification of complex spectra – Double resonance techniques – Shift

reagents – Chemical spin decoupling of rapidly exchangeable protons (OH, SH, COOCH, NH, NH_2) – An elementary treatment of NOE phenomenon – 2D Techniques (COSY, NOESY and ROSY)
Application of Proton NMR in MRI - ^{13}C NMR spectroscopy – Basic theory of FT-NMR – Relaxation – Broad band decoupling – Off resonance decoupling and chemical shift correlations (CH, CH_2, CH_3, aromatic). Identification of structure based on NMR data – Problems.

UNIT III
NQR Spectroscopy
Introduction – Characteristics of quadrupolar nuclei – Effects of field gradient and magnetic field upon quadrupolar energy levels – NQR transitions – Applications of NQR spectroscopy.
Mossbauer Spectroscopy
Introduction – Isomer shift – Magnetic interactions – Mossbauer emission spectroscopy – Applications to iron and tin Compounds.

UNIT IV
Electron Spin Resonance Spectroscopy

Basic concepts of ESR spectroscopy – Spin densities and McConnell equation –Hyperfine splitting – Factors affecting the magnitude of g and A values – Anisotropy in g and A values – ESR spectra of free radicals in solution: methyl, allyl, vinyl and related radicals, benzene anion, p-benzo-semiquinone, pnitrobenzoate dianion – naphthalene dianion, – Spin-trapping – CINDNP and CIDEP techniques – Double resonance in ESR – Advantages of ENDOR spectroscopy.
UNIT V
Electron Paramagnetic Resonance Spectroscopy

Applications of EPR to some simple inorganic systems such as Xe^{2+} – Factors affecting the magnitude of g and A tensors in metal complexes – Zero-field splitting and Kramers degeneracy -- Spectra of VO(II), Mn(II), Fe(II), Co(II), Ni(II) and Cu(II) complexes – EPR spectra of dinuclear Cu(II) complexes - Applications of EPR to a few metallobiomolecules containing Cu(II) and Fe(III) ions. Basic principles of ENDOR spectroscopy and its applications in inorganic Chemistry.

References

UNIT I
1. E. A. V Ebsworth, David W. H. Rankin and Stephen Cradock, Structural Methods in Inorganic Chemistry, Blackwell Scientific Publications, U. K. 1987

UNIT II
1. W. Kemp, NMR in Chemistry – A Multinuclear Introduction, McMillan,1986.
2. C. D .Becker, High Resolution NMR – Theory andApplications, Academic Press, 2nd Edition, 1980.
3. Silverstein and Webster, Spectrometric Identification of Organic Compounds, Sixth Edition, Wiley, 1998.
4. B. P. Straughan and S. Walker , Spectroscopy Vol. I, Chapman and Hall, 1976.
5. R. S. Drago, Physical Methods in Inorganic Chemistry, 3rd Edition, Wiley Eastern Company.
6. D. L. Pavia, G. M. Lampmann, G. S. Kriz, Introduction to Spectroscopy, Thomson, 3rd edition, 2001.

UNIT III
1. R. S. Drago, Physical Methods in Inorganic Chemistry, 3rd Ed., Wiley Eastern company.
2. T. C. Gibbs, Principles of Mössbauer Spectroscopy, Chapman and Hall, 1976.
3. T. P. Das and E. L. Hah, NQR Spectroscopy, Acad. Press, Ny, 1958.

UNIT IV
1. B. P. Straughan and S. Walker, Spectroscopy, Chapman and Hall, London, vol.1 and 2, 1976.

2. C. N. Banwell, Fundamentals of Molecular Spectroscopy, 3rd edition, Tata- McGraw Hill, New Delhi, 1983.12
3. G. M. Barrow, Introduction to Molecular Spectroscopy, McGraw-Hill, New York, 1964.
4. R. S. Drago, Physical Methods in Chemistry, Saunders, 1977.

UNIT V

1. R. S. Drago, Physical Methods in Inorganic Chemistry, Third Edition, Wilely Eastern,
2. M. C. R. Symons, Chemical and Biochemical Aspects of Electron Spin Resonance Spectroscopy, Van Nostrand Reinhold Co., 1978.
3. J. A. Weil, J. R. Boldton and J. E. Wertz, Electron Paramagnetic Resonance: Elementary Theory and Practical Applications, John Wiley and sons, 1994.
4. F. E. Mabbs and D. Collison, Electron Paramagnetic Resonance of d Transition Metal Compounds, Elsevier, 1992

Relationship matrix for Course outcomes,Programme outcomes/Programme specific outcomes

Course outcomes	Programme outcomes(PO)					Programme specific outcomes(PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	3	2	2	2	3	2	2	3	2.4
CO2	2	2	1	3	2	2	2	3	2	3	2.2
CO3	3	2	3	2	3	2	3	3	2	1	2.4
CO4	2	1	3	2	3	3	2	1	3	3	2.3
CO5	2	3	2	2	2	3	3	2	2	2	2.3
Mean overall Score											2.32(High)

Question Paper Pattern

Maximum Marks: 75 **Exam duration: Three Hours**

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)
Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)
Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

HEAD OF THE DEPARTMENT OF CHEMISTRY
RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR - 613 005

Semester	Code	Course	Title of the Paper	Hours/Week	Credits	Medium
I	A1MPTL3	CC-3	Teaching and Learning Skills	4	4	English

Course Objectives

- To understand the basic knowledge about computer system and their functions
- To gain the basic knowledge about communication skills
- To understand the communication process through the web
- To study the basics of Instructional Technology
- To know the types and various skills of teaching

Course Outcomes (CO)

On successful completion of the course, scholars will be able to

CO No.	CO-Statements
CO1	understand the develop skills of ICT and apply them in teaching learning context and Research.
CO2	acquire the knowledge of communication skill with special reference to its elements, types, development and styles.
CO3	gain the depth understanding in communication Technology and Computer mediated teaching and develop multimedia / e- content in their respective subject.
CO4	acquire the complete knowledge about Instructional Technology and its Applications.
CO5	develop the different kinds of teaching skills for putting the content across to the participants.

Unit I

Computer Application Skills

Computer system: Characteristics, Parts and their functions – Different generations of Computer – Operation of Computer: switching on / off / restart, Mouse control, Use of key board and some functions of key – Information and 8 Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations

Unit II

Communication Skills

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and written; Non-verbal communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and writing – Methods of developing fluency in oral and written communication – style, Diction and Vocabulary – Classroom communication and dynamics

Unit III

Communication Technology

Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, Econtent – Satellite-based communication: EDUSAT and ETV channels, Communication through web: Audio and Video applications on the Internet, interpersonal communication through the web.

Unit IV

Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation – Versatility of lecture technique – Demonstration, Characteristics, Principles, Planning Implementation and Evaluation – Teaching – Learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Models of teaching: CAI, CMI and WBI

Unit V

Teaching Skills

Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills

References

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi 9
2. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
3. Information and Communication Technology in Education: A Curriculum for Schools and programme of Teacher development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002
4. Kumar K.I (2008) Educational Technology, New Age International Publishers, New Delhi
5. Mangal, S.K. (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana
6. Michael D. and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York
7. Pandey S.K. (2005) Teaching Communication, Commonwealth Publishers, New Delhi
8. Ram Babu A. and Dandapani S (2006) Microteaching (Vol.1&2) Neelakamal Publications, Hyderabad
9. Singh V.K. and Sudarshan K.N. (1996) Computer Education, Discovery Publishing Company, New York 10.Sharma R. A. (2006) Fundamentals of Educational Technology, Surya Publications, Meerut
11. Vanaja. M. and Rajasekar S. (2006) Computer Education, Neelkamal Publications, Hyderabad.

Relationship matrix for Course outcomes,Programme outcomes/Programme specific outcomes

Course outcomes	Programme outcomes(PO)					Programme specific outcomes(PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	2	1	3	2	1	2	3	2	2.2
CO2	2	3	3	2	2	3	2	2	2	3	2.4
CO3	2	3	2	3	2	2	3	3	2	2	2.3
CO4	3	2	2	3	3	2	2	3	1	3	2.4
CO5	2	2	3	2	3	2	2	3	3	2	2.4
Mean overall Score											2.34(High)

Question Paper Pattern

Maximum Marks: 75 **Exam duration: Three Hours**

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

HEAD OF THE DEPARTMENT OF CHEMISTRY
RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR - 613 005

Semester	Code	Course	Title of the Paper	Hours/Week	Credits	Medium
I	A1MCH4A	CC-4	Principles and Advances in Medicinal Chemistry	4	4	English

GUIDE: Dr. M. RAVISHANKAR
ASST.PROFESSOR OF CHEMISTRY

Course Objectives

- To understand the basic concept of drugs
- To study the basic knowledge of drug delivery
- To impart knowledge in drug designing
- To know the Principles of Combinatorial Synthesis
- To understand the Application of Drugs for Treatment

Course Outcomes (CO)

On successful completion of the course, scholars will be able to

CO No.	CO-Statements
CO1	get in-depth knowledge about the nomenclature and mechanism of drugs
CO2	Get the complete idea about SAR activity and drug metabolism
CO3	Get detailed knowledge about drug design and pharmacokinetic issues.
CO4	impart the knowledge on the Combinatorial synthesis for drug discovery
CO5	Attain depth the knowledge in the structure, properties and mechanism of different kinds of drus.

UNIT I
Nomenclature and Mechanism of Drugs

Introduction – Study of drugs – Important terminologies in pharmaceutical chemistry – Classification and nomenclature of drugs – Nomenclature of some heterocyclic systems – Mechanism of action of drugs – metabolism of drugs – Absorption of drugs – Assay of drugs.

UNIT II
Drug Discovery and Development

Introduction – Choosing a drug target – Identifying a bioassay – Finding a lead compound – Structure-activity relationship(SAR) – Identification of a pharmacophore – Drug metabolism – Manufacture-synthetic issues – Toxicity – Clinical trials – Patents.

UNIT III
Drug Design and Pharmacokinetics

Drug design: Variation of substituents, chain extension, ring expansions/contractions, ring variations, ring fusions, isosteres, rigidification of the structure, conformational blockers.

Pharmacokinetics: Pharmacokinetics issues in drug design – Solubility and membrane permeability – Resistant to hydrolysis and metabolism – Targeting drugs – Reducing toxicity – Prodrugs – Methods of administration – Formulation.

UNIT IV
Combinatorial Synthesis

Introduction – Combinatorial synthesis for drug discovery – Solid phase techniques – Methods of parallel synthesis – Mixed combinatorial synthesis – Deconvolution – Structure determination of the active compound – Limitations – Examples – Designing a combinatorial synthesis – Testing for activity.

UNIT V

Application of Drugs for Treatment

Structure, properties and mechanism of action of the following: Antibacterial drugs – Sulpha drugs: Sulphanilamide, Sulphadiazine, Suphapyridine. Antibiotics – Chloramphenical, Pencillin, Streptomycin. Antiseptics and disinfectants: Phenol and its derivatives, Halogen compounds and organic mercurials. Analgesics: Morphine, Heroin, Pethidine, Morphinan. Anticonvulsant: Barbiturates, Oxazolindiones. Diabetes: Control of diabetes, Insulin. Cancer and anti neo plastic drugs: Allylating agents, Anti metabolites, Plant products. Cardio vascular drugs: Anti arrhythemic drugs, Anti hypertension drugs.

Textbooks and Reference books

1. G. L. Patrick, An Introduction to Medicinal Chemistry, Oxford University Press, 2nd Edition,2001.
2. J. Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand and Co., New Delhi, 2006.
3. A. Kar, Medicinal Chemistry, New Age International (P) Ltd, Delhi, 1997.

Relationship matrix for Course outcomes,Programme outcomes/Programme specific outcomes

Course outcomes	Programme outcomes(PO)					Programme specific outcomes(PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	2	2	3	3	2	2	3	2	3	2.4
CO2	2	1	3	2	3	3	2	2	3	2	2.3
CO3	3	3	2	2	1	2	3	1	2	3	2.4
CO4	2	2	3	3	2	2	2	3	2	3	2.4
CO5	3	2	2	2	2	3	3	2	2	1	2.2
Mean overall Score											2.34(High)

Question Paper Pattern

Maximum Marks: 75 **Exam duration: Three Hours**

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)
Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)
Part C – 3 X 10 =.30 Answer Any THREE (One question from each unit)

Signature of the HOD

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RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR - 613 005

Semester	Code	Course	Title of the Paper	Hours/Week	Credits	Medium
I	A1MCH4B	CC-4	Synthetic Chemistry	4	4	English

GUIDES: 1. Dr. N. INGARSAL 2 .Dr. C. KATHIRAVAN AND 3. Dr. J. ELONGOVAN

ASST.PROFESSORS OF CHEMISTRY

Course Objectives

- To know the common Laboratory practices
- To study some benzodiazepine, thiazine and pyrimidine derivatives
- To understand the multicomponent reactions
- To get the deep knowledge on novel pyrazoline derivatives
- To attain the detailed information about transition metal complexes.

Course Outcomes (CO)

On successful completion of the course, scholars will be able to

CO No.	CO-Statements
CO1	Get sufficient expertise in the usage, handling and safety management of chemicals in laboratory
CO2	get in-depth knowledge about the synthesis and various applications of some benzodiazepine, thiazine and pyrimidine derivatives
CO3	Recollect the fundamentals and synthetic utility of various multicomponent reactions
CO4	Understand the synthesis and characterization of some novel pyrozoline derivatives.
CO5	Obtain the deep sense about the synthesis, properties and biological studies of some transition metal complexes.

UNIT-1

Laboratory Techniques

Documentation and records. Cleaning of glassware and apparatus in chemistry lab, assembling the apparatus, use of inert atmosphere, measurement and control of basic reaction parameters, addition of reagents, concentration and isolation of products. Safety-Accident management, personal protective equipment, identification of chemicals-Chemical spillage, electrical shock, eye injuries, ingestion and inhalation of chemicals. Collection and disposal of waste and hazardous chemicals.

UNIT-1I

Synthesis and Characterization

Synthesis of 1,4-benzodiazepine, 1,5-benzodiazepine, diazepinols and diazepinones - Characterization. Synthesis and antimicrobial studies of 1,3-thiazines and Pyrimidine derivatives - Characterization. Applications of benzodiazepine, thiazines and pyrimidine derivatives.

UNIT-III

Multicomponent Reactions

Reaction pathway of Biginelli, Hantzsch, Mannich, Passerini and Ugi multicomponent reactions – mechanisms based on Knoevenagel, Enamine formations, urea and thiourea additions, iminium intermediates, Lewis acid and base catalyzed reactions – synthetic utility and important features of multicomponent reactions.

UNIT-IV

Novel Pyrazoline Derivatives

Nomenclature of different substituted pyrazoline derivatives. Synthesis of 4, 5-dihydropyrazolines carrying pyrimidine moiety and 2-pyrazoline derivatives carrying other heterocyclic moiety through microwave, conventional and grinding methods. Mechanism of formation of different 2-pyrazoline compounds and their spectral characterizations by using FT-IR, ^{1}H NMR, ^{13}C-NMR and ESI-MS techniques.

UNIT-V

Transition Metal Complexes

Synthesis, Spectroscopy, Thermal Analysis, Magnetic Properties and Biological studies of some transition metal complexes with organic ligands. Like Zu(II), Ni(II) and Co(II) Complexes with Schiff Base Ligands.

References

1.R.Gopalan, K.Rangarajan and P.S.Subramanian,Elements of Analytical Chemistry, Third Edition,Sultan Chand and Sons

2. X.Q.Pan, J.P.Zou, Z.H.Huang and W.Zhang, *Tetrahedron Lett.,* 49, 5302-5308, **2008.**

3. H.G.Bonacorso, R.V.Lourega, E.D.Deon, N.Zanatta and A.P.Martns, *Tetrahedron Lett.,* 48, 4835-4838, **2007.**

4. K.Kim,S.K.Volkman and J.A.Ellman, *J. Braz. Chem. Soc.,* 9 (4), 375-379,**1998.**

5. D.Giles, K.Roopa, F.R.Sheeba, P.M.Gurubasavarajaswamy, G.Divakar and T.Vidhya, *Eur. J. Med. Chem.,* 58, 478-484, **2012.**

6. M.Koketsu, K.Tanaka, Y.Takenaka, C.D.Kwong and H.Ishihara, *Eur. J. Pharm. Sci.*, 15 , 307-310, **2002.**

7. A.Nagaraj and C.Sanjeeva Reddy, J.Iran. Chem. Soc., 5 (2), 262-267, **2008.**

8. H.G.O.Alvim, E.N.Da Silva Junior and B.A.D.Neto, *RSC Advances*, 00, 1-3, 1-19, **2013.** DOI:10.1039/XOXXOOOOOX.

9. A.Adhikari, B.Kalluraya, K.V.Sujith, K.Gouthamchandra, R.Jairam., *Eur. J. Med. Chem.,* 55, 467-474, **2012.**

10. A.Ozdem, I.R.Gulhan, T.Zitouni, Z.A.Kaplancikli, *Turk J. Chem.*, 32, 529- 538, 2008.

11. B. Ramesh and T.Sumana., *E-Journal of Chemistry*, 7(2), 514-516, **2010.**

12. S.B.Zangade, S.S.Mokle, A.T.Shinde, B.Yeshwant, *Green Chem. Lett. Revi.*, 6, (2), 123127, **2013.**

13. R.A.Ahmadi and S.Amani, *Molecules*, 17, 6434-6448, **2012.** DOI: 10.3390/molecules17066434.

14. A.R.Bendale, R.Bhatt, A.Nagar, A.G.Jadhav and G.Vidyasagar, ***Der*** *Pharma Chemica*, 3 (2), 34-38, **2011.**

15. P.R.Patel, B.T.Thaker and S.Zele, *Ind. J. Chem.*, 38A, 563, **1999.**

16. L.Mitu, M.Ilis, N.Raman, M.Imran, S.Ravichandran, *E-J. Chem.,* 9, 365-372, **2012.**

Relationship matrix for Course outcomes,Programme outcomes/Programme specific outcomes

Course outcomes	Programme outcomes(PO)					Programme specific outcomes(PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	3	2	3	1	2	3	3	2	3	2.4
CO2	3	2	1	2	3	3	1	3	3	2	2.3
CO3	2	2	3	2	3	2	2	2	3	2	2.3
CO4	2	2	3	3	2	2	2	3	2	3	2.4
CO5	3	2	3	1	2	3	3	2	1	2	2.2
Mean overall Score											2.32(High)

Question Paper Pattern

Maximum Marks: 75 **Exam duration: Three Hours**

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

HEAD OF THE DEPARTMENT OF CHEMISTRY
RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR - 613 005

Signature of the HOD

Semester	Code	Course	Title of the Paper	Hours/Week	Credits	Medium
I	A1MCH4C	CC-4	Organic Reaction Mechanism	4	4	English

GUIDE: Dr. R. CHITHIRAVEL
ASST.PROFESSOR OF CHEMISTRY

Course Objectives

- To state the Hard and Soft Acid Base principles in synthetic organic chemistry
- To describe a "reactive intermediate" in organic synthesis
- To identify the stereo chemical and conformational effect
- To illustrate the molecular rearrangement involving electron deficient atom
- To study how the functional group rearrangements involved in various steps

Course Outcomes (CO)

On successful completion of the course, scholars will be able to

CO No.	CO-Statements
CO1	Use curly arrow reaction mechanisms and knowledge of the relative stability of intermediates to predict and / or account for the products of reactions
CO2	Recognize the functional group transformation
CO3	Design experiments to probe asymmetric induction mechanisms
CO4	Recognize principle of stereochemistry
CO5	Combine reactions to achieve simple synthesis of target molecules.

UNIT I

Basic concepts in organic chemistry

Hard and Soft Acid Base principles - Types of organic reactions – substitution, elimination and addition reactions – Reactive intermediates – stereochemical and conformational effects on reactivity and specificity; reaction with diboranes and peracids - Michael reaction- Robinson annulation – Reactivity umpolung – acyl anion equivalent- Molecular rearrangements involving electron deficient atoms.

UNIT II

Reagents and reactions

Functional group transformations – Reagents for the inter conversion of various groups – Special and specific oxidizing agents, reducing agents and organo metallic compounds for the inter conversions – The survey of reactions and reagents – Gilman's reagent – LDA – DCC – 1,3-dithiane – Trimethyl silyl iodide – Wilkinson's catalyst – OsO_4 – DDQ – SeO_2.

UNIT III

Asymmetric synthesis

Chiral auxiliaries, methods of asymmetric induction – substrate, reagent and catalyst controlled reactions; determination of enantiomeric and diastereomeric excess; enantio-discrimination. Resolution – optical and kinetic.

UNIT IV

Principles of stereochemistry

Configurational and conformational isomerism in acyclic and cyclic compounds; stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction.

UNIT V

Heterocyclic compounds

Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O, N, S).

References

1. Advanced Organic Chemistry by J. March, 1992, Fourth edition, New York, John Wiley and Sons.
2. Organic Chemistry by J. Clayden, N. Greeves and S. Warren.
3. Mechanism and Structure in Organic Chemistry by Gould ES, 1959, Now York, Holt Rinehart and Winston.
4. Principles of Asymmetric Synthesis by R. E. Gawley and J. Aube
5. Stereochemistry of Carbon Compounds by E. L. Eliel
6. Stereochemistry of Organic Compound by D. Nasipuri
7. Organic Chemistry Vol. II and I by I. L. Finar

Relationship matrix for Course outcomes,Programme outcomes/Programme specific outcomes

Course outcomes	Programme outcomes(PO)					Programme specific outcomes(PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	2	3	2	2	1	3	2	3	2.3
CO2	2	2	2	2	3	3	2	3	3	2	2.4
CO3	2	3	1	2	3	2	3	2	2	3	2.3
CO4	3	2	3	2	2	2	2	3	1	3	2.3
CO5	1	2	3	3	2	3	3	2	3	2	2.4
Mean overall Score											2.34(High)

Question Paper Pattern

Maximum Marks: 75 **Exam duration: Three Hours**

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)
Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)
Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

HEAD OF THE DEPARTMENT OF CHEMISTR
RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR - 613 005

Semester	Code	Course	Title of the Paper	Hours/Week	Credits	Medium
I	A1MCH4D	CC-4	Chemistry of Polymers and Deep Eutectic Solvents	4	4	English

GUIDES: Dr. D. ILANGESWARAN and Dr. T. RAJKUMAR
ASST.PROFESSORS OF CHEMISTRY

Course Objectives

- To understand the basic knowledge of polymers
- To know the synthetic methodologies of polymers
- To study the character analysis of synthesized polymers
- To determine the characterization of polymers using FTIR and NMR Spectra
- To impart the knowledge on deep eutectic system

Course Outcomes (CO)

On successful completion of the course, scholars will be able to

CO No.	CO-Statements
CO1	Obtain in depth knowledge about different kinds of polymerization and their influence on the development of new materials
CO2	understand the versatile knowledge about the electrochemical and mechano chemical synthesis of polymers
CO3	determine the composition and microstructure of polymers using various kinds of microscopic techniques
CO4	Attain in-depth knowledge about polymers characterization using FTIR and NMR Spectra
CO5	Get the detailed information about the synthesis, characterization and applications of deep eutectic solvent.

UNIT 1

General procedures in chain-growth polymerization:

Free-radical chain polymerization - Anionic polymerization - Ring-opening polymerizations initiated by anionic reagents - Coordination polymers

Step-growth polymerization—basics and development of new materials:

The synthesis of an aromatic polyamide - Preparation of a main-chain liquid crystalline poly(ester ether) with a flexible side-chain - Non-periodic crystallization from a side-chain bearing copolyester - A comparison of melt polymerization of an aromatic di-acid containing an ethyleneglycol spacer with polymerization in a solvent and dispersion in an inorganic medium - Synthesis and extraction of cyclic oligomers of poly(ether ketone) - Synthesis of some sulfone-linked paracyclophanes from macrocyclic thioethers

UNIT 2

The synthesis of conducting polymers based on heterocyclic compounds

Introduction - Electrochemical synthesis - Synthesis of poly pyrrole - Synthesis of polyaniline - Synthesis of polythiophene

Chemical Synthesis of polymers:

Nitrogen-containing mesoporous polymers - synthesis of sulfonated block copolymers - poly(4-aminodiphenylamine)/Ag nanocomposite - Polydiphenylamine/carbon nanotube composites - polystyrene-graft-palmitic acid copolymers - poly(propylene imine) dendrimer-Polypyrrole.

Mechanochemical Preparation of Polymers: Polydiphenylamine - polypyrrole nanospheres.

UNIT 3

Polymer characterization

Introduction - Synthetic routes to polymers - Molecular weight determination - Composition and microstructure - Optical microscopy - Electron microscopy - Analytical microscopy - Scanning probe microscopy - Thermal analysis - Molecular relaxation spectroscopy - X-ray and neutron scattering methods

UNIT 4

Polymers Characterization Using FTIR and NMR Spectra

poly(MA-alt-NIPA) copolymer – copolymer matrix of P(MMA-MAh) - copolymerization study of o-toluidine and o-aminophenol - Copolymerization of aniline with m-nitroaniline - properties of soluble sulfonated polybenzimidazoles - Poly(benzoxazine-co-urethane)s - characterization of an electrochromic material from poly(1,4-bis(3-methylthiophen-2-yl)benzene)

UNIT 5

Deep Eutectic Solvents (DES)

Deep Eutectic Solvents - Synthesis, Properties and Applications; Role of DES in the synthesis of Polymers and related materials; Applications of DES in nano-technology

References

Unit1 : Polymer Chemistry – A Practical Approach, Fred J. Davis, Oxford University Press, 2004

Unit 2: Polymer Chemistry – A Practical Approach, Fred J. Davis, Oxford University Press, 2004

Research Articles

1. Direct triblock-copolymer-templating synthesis of ordered nitrogen-containing mesoporous polymers, Jianping Yang, Yunpu Zhai, Yonghui Deng, Dong Gu, Qiang Li, Qingling Wu, Yan Huang, Bo Tu, Dongyuan Zhao, *Journal of Colloid and Interface Science* 342 (2010) 579-585.
2. Controlled synthesis of sulfonated block copolymers having thermoresponsive property by RAFT polymerization of vinyl sulfonate esters, Hideharu Mori, Yosuke Saito, Eri Takahashi, Kazuhiro Nakabayashi, Atsuhiko Onuma, Makoto Morishima, *Polymer* 53 (2012) 3861-3877.
3. Course of poly(4-aminodiphenylamine)/Ag nanocomposite formation through UV–vis spectroscopy, Starlet Thanjam, M. Francklin Philips, S. Komathi, P. Manisankar, C. Sivakumar, A. Gopalan, Kwang-Pill Lee, *Spectrochimica Acta Part A* 79 (2011) 1256-1266.
4. Polydiphenylamine/carbon nanotube composites for applications in rechargeable lithium batteries, Mihaela Baibaraca, Ioan Baltog, Serge Lefrant, Pedro Gomez-Romero, *Materials Science and Engineering* B176 (2011) 110-120.
5. Synthesis and thermal energy storage characteristics of polystyrene-graft-palmitic acid copolymers as solid–solid phase change materials, Ahmet Sarı, Cemil Alkan, Alper Bicer, Ali Karaipekli, *Solar Energy Materials & Solar Cells* 95 (2011) 3195-3201.
6. Synthesis and characterization of poly(propylene imine) dendrimer – Polypyrrole conducting star copolymer, Abd Almonam A. Baleg, Nazeem M. Jahed, Omotayo A. Arotiba, Stephen N. Mailu, Nicolette R. Hendricks, Priscilla G. Baker, Emmanuel I. Iwuoha, *Journal of Electroanalytical Chemistry* 652 (2011) 18-25.
7. Mechanochemical preparation of polydiphenylamine and its electrochemical performance in hybrid supercapacitors, SP. Palaniappan, P. Manisankar, *Electrochimica Acta* 56 (2011) 6123- 6130.
8. Rapid synthesis of polypyrrole nanospheres by greener mechanochemical route, SP. Palaniappan, P. Manisankar, *Materials Chemistry and Physics*122 (2010) 15-17.

Unit 3

9. Polymer Chemistry – A Practical Approach, Fred J. Davis, Oxford University Press, 2004

Unit 4

10. The synthesis of poly(MA-alt-NIPA) copolymer, spectroscopic characterization, and the investigation of solubility profile-viscosity behavior, D. Demircan, G. Kibarer, A.Gu¨ner, Z.M.O. Rzaev, E. Ersoy, *Carbohydrate Polymers* 72 (2008) 682-694.

11. Analysis of the interaction using FTIR within the components of OREC composite GPE based on the synthesized copolymer matrix of P(MMA-MAh), Yun Huang, Xiaoyan Ma, Guozheng Liang, Shuhui Wang, Qilu Zhang, *Polymer* 49 (2008) 2085-2094.
12. Electrochemical copolymerization study of o-toluidine and o-aminophenol by the simultaneous EQCM and in situ FTIR spectroelectrochemisty, Qin Yanga, Youyu Zhang, Haitao Li, Yuqin Zhang, Meiling Liu, Jiao Luo, Liang Tan, Hao Tang, Shouzhuo Yao, *Talanta* 81 (2010) 664–672.
13. Copolymerization of aniline with m-nitroaniline and removal of m-nitroaniline from aqueous solutions using a polyaniline-modified electrode: A comparative study, Liang Dinga, Qin Li, Dandan Zhou, Hao Cui, Rong Tang, Jianping Zhai, *Electrochimica Acta* 77 (2012) 302-308.
14. Synthesis and properties of soluble sulfonated polybenzimidazoles, Shengbo Qing, Wei Huang. Deyue Yan, *Reactive & Functional Polymers* 66 (2006) 219-227.
15. Poly(benzoxazine-co-urethane)s: A new concept for phenolic/urethane copolymers via one-pot method, Mohamed Baqara, Tarek Agag, Hatsuo Ishida, Syed Qutubuddin, *Polymer* 52 (2011) 307-317.
16. Electrosynthesis and characterization of an electrochromic material from poly(1,4-bis(3-methylthiophen-2-yl)benzene) and its application in electrochromic device, Bin Wang, Jinsheng Zhao, Chuansheng Cui, Jifeng Liu, Qingpeng He, *Solar Energy Materials & Solar Cells* 98 (2012) 161-167.
17. Electrochemical synthesis and spectroelectrochemical behavior of poly (diphenylamine-co-4,4'-diaminodiphenyl sulfone), P. Manisankar, D. Ilangeswaran, *Electrochimica Acta* 55 (2010) 6546-6552.
18. Electrochemical Synthesis, Characterization and Electrochromic Behavior of Poly(4-Aminodiphenylamine-co-4,4'-Diaminodiphenyl Sulfone), D. Ilangeswaran and P. Manisankar, *Electrochimica Acta* In Press, 87 (2013) 895–904.

Unit 5- Review Articles

19. Deep eutectic solvents: syntheses, properties and applications, Qinghua Zhang, Karine De Oliveira Vigier, Se´ bastien Royer and Franc¸ ois Je´ roˆ me, Che. Soc. Rev., 2012, 41, 7108-7146.
20. Deep-eutectic solvents playing multiple roles in the synthesis of polymers and related materials, Daniel Carriazo, Mar´ıa Concepcio´ n Serrano, Mar´ıa Concepcio´ n Gutie´ rrez, Mar´ıa Luisa Ferrer and Francisco del Monte, Chem. Soc. Rev., 2012, 41, 4996–5014.
21. Potential applications of deep eutectic solvents in nanotechnology, Ali Abo-Hamad, Maan Hayyan, Mohammed AbdulHakim AlSaadi, Mohd Ali Hashim, Chemical Engineering Journal 273 (2015) 551–567.

Relationship matrix for Course outcomes, Programme outcomes/Programme specific outcomes

Course outcomes	Programme outcomes(PO)					Programme specific outcomes(PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	2	2	3	2	2	3	3	2	3	2.4
CO2	3	2	2	1	3	2	2	3	3	2	2.3
CO3	2	3	2	2	3	2	1	3	2	3	2.3
CO4	2	2	3	2	2	2	2	3	1	3	2.2
CO5	3	1	3	2	2	2	3	2	3	2	2.3
Mean overall Score											2.3(High)

Question Paper Pattern

Maximum Marks: 75 **Exam duration: Three Hours**

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)
Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)
Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

HEAD OF THE DEPARTMENT OF CHEMISTRY
RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR - 613 005

Semester	Code	Course	Title of the Paper	Hours/Week	Credits	Medium
I	A1MCH4E	CC-4	Crystal Growth and Nonlinear Optics	4	4	English

GUIDE: Dr. K. RAJARAJAN
ASST.PROFESSOR OF CHEMISTRY

Course Objectives

- To understand the basic concepts of crystal growth
- To study the principles and techniques of crystal growth
- To know the various techniques utilized in crystal growth
- To study the different types of characterization techniques
- To impart the basic knowledge on Nonlinearoptics

Course Outcomes (CO)

On successful completion of the course, scholars will be able to

CO No.	CO-Statements
CO1	Attain in depth knowledge about the nucleation and growth kinetics of crystals
CO2	Get the detailed information about the crystal growth techniques
CO3	Know the thorough knowledge about the gel, melt and vapor techniques of crystal growth
CO4	Understand the versatile knowledge about the characterization techniques of crystal growth
CO5	Get the detailed knowledge about the non linear optics

UNIT I

Basic Concepts Nucleation and Kinetics of Growth

Ambient phase equilibrium – Super saturation – Equilibrium of finite phases -Equation of Thomson-Gibbs – Types of nucleation – Formation of critical nucleus – Classical theory of nucleation – Homo and heterogeneous formation of 3D nuclei – Rate of nucleation – Growth from vapor phase, solutions and melts – Epitaxial growth – Growth mechanism and classification – Kinetics of growth of epitaxial films – Mechanisms and controls for nanostructures in 0 and 1 dimensions.

UNIT II

Crystallization Principles and Growth Techniques

Classes of crystal system – Crystal symmetry – Solvents and solutions –Solubility diagram – Super solubility – Expression for super saturation – Metastable zone and induction period – Miers TC diagram – Solution growth – Low and high temperatures solution growth – Slow cooling and solvent evaporation methods – Constant temperature bath as a crystallizer.

UNIT III

Gei, Melt and Vapor Growth Techniques

Principle of gel technique – Various types of gel -- Structure and importance of gel – Methods of gel growth and advantages -- Melt technique – Czochralski growth – Floating zone – Bridgeman method – Horizontal gradient freeze – Flux growth – Hydrothermal growth – Vapor-phase growth – Physical vapor deposition – Chemical vapor deposition – Stoichiometry.

UNIT

IV Characterization Techniques

X–ray diffraction – Powder and single crystal – Fourier transform infrared analysis – Elemental dispersive X-ray analysis – Transmission and scanning electron microscopy – UV-vis-NIR

spectrometer – Chemical etching –Vickers micro hardness – Basic principles and operations of AFM and STM --X-ray photoelectron spectroscopy for chemical analysis – Ultraviolet photoemission spectroscopy analysis for work function of the material Photoluminescence – Thermoluminescence.

UNIT V

Basics of Nonlinear Optics

Wave propagation in an anisotropic crystal – Polarization response of materials to light–Harmonic generation – Second harmonic generation – Sum and difference frequency generation– Phase matching –Semiorganics – Thio urea complex – Laser induced surface damage threshold.

Books for Study

1. I.V. Markov, Crystal Growth for Beginners: Fundamentals of Nucleation, Crystal Growth and Epitaxy (2004) 2nd edition.
2. P. Santhanaragavan and P. Ramasamy, Crystal Growth Process and Methods (KRU Publications, Kumbakonam, 2001).
3. H.H. Willard, L.L. Meritt, J.A. Dean, F.A. Sette, Instrumental Methods of Analysis (CBS Publishers, New Delhi, 1986).
4. S. Zhang, L. Li and A. Kumar, Materials Characterization Techniques (CRC Press, Bota Racon, 2009).

Books for Reference

1. J.C. Brice, Crystal Growth Process (John Wiley, New York, 1986).
2. E. N. Kaufmann, Characterization of Materials, Volume-I (John Wiley, New Jersey, 2012).
3. R.W. Boyd, Nonlinear Optics, 2nd Edn. (Academic Press, New York, 2003)
4. D.L. Mills, Nonlinear Optics – Basic Concepts (Springer, Berlin, 1998).

Relationship matrix for Course outcomes,Programme outcomes/Programme specific outcomes

Course outcomes	Programme outcomes(PO)					Programme specific outcomes(PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	3	3	2	2	2	3	2	2	3	2.4
CO2	2	2	2	3	3	2	2	3	3	2	2.4
CO3	3	1	2	2	3	2	2	3	2	3	2.3
CO4	2	2	3	2	3	3	2	1	2	3	2.3
CO5	3	2	3	1	2	2	3	2	3	2	2.3
Mean overall Score											2.34(High)

Question Paper Pattern

Maximum Marks: 75 **Exam duration: Three Hours**

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

HEAD OF THE DEPARTMENT OF CHEMISTRY
RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR - 613 005

Semester	Code	Course	Title of the Paper	Hours/Week	Credits	Medium
II	A2MCHD	CC-5	Dissertation and Viva Voce	-	8	English

Course Objectives

- To gain the depth knowledge in laboratory Field
- To understand the basic principles of research
- To study the methodology of the research work
- To apply the various spectra to analyze the compounds
- To know the knowledge of presenting project work

Course Outcomes (CO)

On successful completion of the course, scholars will be able to

CO No	CO-Statements
CO1	Gain of background knowledge in specific area of chemical sciences
CO2	Learn the steps involved in solving a problem
CO3	Understand the formatting of table work
CO4	Enter in the first step of research aptitude
CO5	Visualize the steps of project work presentation

Relationship matrix for Course outcomes,Programme outcomes/Programme specific outcomes

Course outcomes	Programme outcomes(PO)					Programme specific outcomes(PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	2	3	2	2	3	2	2	3	2.5
CO2	2	2	3	3	2	3	2	3	2	2	2.4
CO3	2	3	2	2	3	2	3	3	2	1	2.4
CO4	3	2	3	2	3	2	2	2	3	3	2.5
CO5	3	1	3	2	2	3	3	2	3	2	2.4
Mean overall Score											2.44(High)

Signature of the HOD

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