

2020

# THANTHAI HANS ROEVER COLLEGE

(Autonomous)

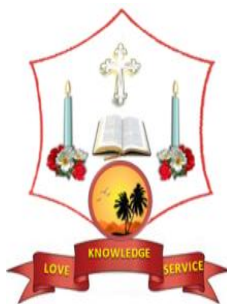
*Accredited by NAAC*

*UGC Recognized 2(f) and 12(B) Institution*

*Affiliated to Bharathidasan University, Tiruchirapalli*

**Perambalur – 621 220,**

**Tamil Nadu, India**



M.Phil CHEMISTRY

**CHOICE BASED CREDIT SYSTEM SYLLABUS**

**SEMESTER PATTERN**

**PG & RESEARCH DEPARTMENT OF**

**CHEMISTRY**

**(2020-2021 ONWARDS)**

**THANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)  
ELAMBALUR, PERAMBALUR – 621 220  
PG & RESEARCH DEPARTMENT OF CHEMISTRY**



**VISION**

To blossom as an institution of excellence, enabling, empowering and enlightening the youth and shaping them as fully developed human beings with the capacity to unfold their full mental potentiality resulting in the attainment of the wisdom to live constructively and meaningfully.

**MISSION**

- To provide congenial and stress- free environment and opportunities for the enhancement of knowledge and acquisition skills through the best exposure and training possible.
- To offer multifaceted and need-based academic programmes and to promote extension activities.
- To adopt technology-enabled new methods, approaches and techniques so that the teaching-learning process becomes learner-centred and learner-friendly.
- To maximize the participation of all the stakeholders in the development of the institution and the region.
- To sensitize the youth towards inclusive growth for socio-economic change, sustainable development, gender equality, eco-friendliness, etc.
- To enable the youth to experience the effects of globalization and facilitate them to grow as responsible citizens and leaders.
- To inspire them, through value-based education, to embrace the entire humanity while firmly rooted in the Indian ethos.
- To provide regular placement training and placement opportunities.

- To kindle the spirit of creativity and enhance research activities and enable them to attain international standards.

## **PROGRAMME OUTCOMES**

Master of Philosophy Programmes

Upon completion of the programme, the scholar will be able to

1. Adopt self – learning through reviews of previously acquired knowledge.
2. Implement research by focusing on newer thrust areas of knowledge.
3. Engage in quality and efficient designing, implementing and evaluating of the gathered information.
4. Demonstrate technical and analytical competence with local and global perspective.
5. Have professional integrity with knowledge of appropriate code of ethics and standards displaying social responsibilities.

## **PROGRAMME SPECIFIC OUTCOMES**

1. Pursue Ph.D programme with norms of scholarly research that chip into the augmentation of students personal and professional development.
2. Acquire in-depth knowledge of the process of developing new materials as well as gain expertise of well defined area of research in Chemistry.
3. Develop innovative methodologies to tackle issues identified and contributing to the development of technological knowledge and intellectual property
4. The students are exposed to electronic material / media using the computers and hone their drawing skills with chemical structures. The students develop the ability of predicting molecular geometries and estimating their properties theoretically by using the network laboratory.
5. The students come out with clear idea of choosing research problems, writing new projects and publishing research papers in journals.



**THANTHAI HANS ROEVER COLLEGE PERAMBALUR-621212**  
**(AUTONOMOUS)**  
**M.Phil Chemistry –Course Structure Under CBCS**  
**(For the candidates to be admitted from the academic year 2020-2021 onwards)**



Semester	Course Code No	Title of the Course Paper	Credits	Exam hours	CIA	ESE	Total
First Semester	20MPCH1CC1	Research Methodology in chemistry	4	3	75	25	100
	20MPCH1CC2	Recent Trends in Chemistry	4	3	75	25	100
	20MPCH1CC3	Teaching and Learning Skills	4	3	75	25	100
	20MPCH1CC4	Paper on Topic of Research (Guide will prepare the syllabus and it will be sent to the COE)	4	3	75	25	100
<b>Total</b>			<b>16</b>	-	-	-	<b>400</b>
Second Semester	20MPCH2DW	Dissertation and Viva-Voce	<b>8</b>	-	-	-	<b>200</b>
Total			<b>24</b>	-	-	-	<b>600</b>

**CIA**- Continuous Internal Assessment

**ESE**- End Semester Examinations

## SEMESTER-I

### Research Methodology in chemistry

**Core course: I**

**Credit :4**

**Max.Marks :100**

**Instructional Hours: 6**

**Course Outcomes**

**Exam Hours : 3**

**Course code: 20MPCH1CC1**

**Internal : 25**

**External :75**

- To enable the students to develop their knowledge of problem choosing the research
- To enable the students to write the thesis
- To enable the students to determine the types of errors
- To enable the students to understand about computer networks
- To enable the students to understand about chemical safety

#### **UNIT - I Basic Principles of Research**

Meaning of Research - Need for research. Objectives – Motivation – Types of research – Significance - Formulation of Research Problem – Developing Hypothesis - Preparing Research Design - Selection of Research Problem – Determining Sample Design Characteristics of a Good Sample Design - Collection of Data – Methods of Data Collection - Execution of Work. Analysis of Data – Hypothesis, Testing - Generalization and Interpretation - Preparation of Report - Submission of Report in the form of Thesis.

#### **UNIT-II : Literature Searching and Writing Reports:**

##### **Literature Searching**

On-line searching, Database, Scifinder, Scopus, CA on CD Locating research article, Citation Index, Impact Factor

##### **Writing scientific report :**

Planning, preparation, draft, revision and refining; writing project proposal to funding agency, Paper writing for International Journals, submitting to editors. Conference presentation, preparation of effective slides and presentation.

### **UNIT III: Statistical Tools of research**

Significant figures, Precision, accuracy, Error analysis, types of errors. Mean, median, measures of spread – range, standard deviation and variance – F test, t test – Types of correlation, correlation coefficient, Regression analysis – binomial distribution, normal distribution – hypothesis generation and testing of hypothesis

### **UNIT-IV: Introduction to Computing and Networking**

Introduction to computers and computing – hardware, Basic organization of a computer, CPU, Main memory, Secondary storage, I/O device, Software, System and application software, High and low level languages, Compilers, Algorithms and Flow charts.

Introduction to networking – Computer networks, Network components, Hubs, switches, repeaters, routers, bridges and gateways – LAN, WAN, internet and internet worldwide web, internet for chemists – online search of chemistry databases, e-journals, search engines for chemistry, chemweb.

### **UNIT-V Chemical safety and Disaster Management :**

**(a) Emergency response:** chemical spills, radiation spills, biohazard spills, leaking compressed gas cylinders, fires, medical emergency accident reporting

**b) General safety :** General safety and operational rules, safety equipments, personal protective equipments, compressed gas safety, safety practices for disposal of broken glass wares, centrifuge safety, treated biomedical wastes and scientific ethics.

### **REFERENCES:**

1. Thesis and Assignment writing, J. Anderson, B.H.Durstun and M.Poole, John Wiley Publications, Sydney. 1970.
2. How to write a research paper, R.Berry, Pergoman, 1969.
3. Fundamentals of analytical Chemistry by D. A. Skoog, D. M. West and F. J. Hooler.
4. Quality in the Analytical Chemistry Laboratory by R. D. Treble and D. G. Holcombe.
5. Eckschlager K., 1969, —Errors, Measurement and results in chemical analysisl, London, Van Nostrant Reinhold company
6. K.V. Raman, “Computer in Chemistry”, Tata McGraw Hill, New Delhi,1993.

7. Practical Skills in Chemistry, J. R. Dean, A. M. Jones, D. Holmes, R. Reed, J. Weyers and A Jones, Pearson Education Ltd. [ Prentice Hall] (2002)

### Question Pattern

<b>Section-A</b>	<b>Two Question For Each Unit</b>	<b>10x 2 = 20</b>
<b>Section-B</b>	<b>Internal Choice and On Set Of Questions From Each Unit</b>	<b>5x 5 = 25</b>
<b>Section-C</b>	<b>Answer Any Three Out Of 5 Questions and One Questions From Each Unit</b>	<b>3x 10= 30</b>

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
<b>I</b>	20MPCH1CC1	Research Methodology in chemistry					4	3			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
<b>CO1</b>	✓		✓	✓		✓	✓	✓	✓	✓	
<b>CO2</b>	✓	✓		✓	✓		✓	✓	✓	✓	
<b>CO3</b>	✓			✓	✓	✓	✓	✓	✓		
<b>CO4</b>	✓		✓		✓	✓	✓	✓		✓	
<b>CO5</b>	✓	✓	✓	✓		✓		✓	✓	✓	
Number of Matches(✓) = 38 Relationship: High											

<b>Mapping</b>	1-29%	30-59%	60-69%	70-89%	90-100%
<b>Matches</b>	1-14	15-29	30-34	35-44	45-50
<b>Relationship</b>	Very Poor	Poor	Moderate	High	Very High

## SEMESTER-I

### RESENT TRENDS IN CHEMISTRY

**Core course: II**

**Credit :4**

**Max.Marks :100**

**Instructional Hours: 6**

**Course Outcomes**

**Exam Hours : 3**

**Course code: 20MPCH1CC2**

**Internal : 25**

**External :75**

- To enable the students to develop their knowledge of problem choosing the research
- To enable the students to write the thesis
- To enable the students to determine the types of errors
- To enable the students to understand about computer networks
- To enable the students to understand about chemical safety

#### **UNIT-I : NMR, IR and Mass Spectroscopy:**

- a) IR spectroscopy: Applications of IR in analysis.
- b) NMR spectroscopy: Chemical shifts, and coupling constant, Introduction of NOE, DEPT and 2D NMR, <sup>13</sup>CNMR and its applications.
- c) Mass spectroscopy: Mass spectral fragmentation of complex molecules and its applications.
- d) Combined spectroscopic problems based on IR, NMR, and mass spectral data

#### **UNIT-II Electroanalytical Techniques**

Polarography – Theory, DME and importance, Current Voltage curves, Diffusion current and its theory, factors affection it. Polarographic wave and half wave potentials, applications. Oscillographic Polarography, Square wave polarography, Tensimetry. Chronopotentiometry - Cyclic Voltammery, Amperometry, theoretical principles, applications in chemical investigations. Electrogravimetry – Principles and applications.

#### **UNIT-III**

##### **Nanotechnology:**

Introduction- Nanotechnology and Nanomachines molecular nanotechnology -methods of synthesis of nano materials - plasma arching, sol-gel method - electro deposition, ball milling - analytical tools to study nano materials (SEM, TEM & SPM) -applications of nano chemistry -



CNT and its applications - molecular switches - rotaxanes - catenanes - lithography - nano biometrics - metal nano clusters - nano crystals - quantum wells, dots, wires, etc -biological materials - future applications

### **Sonochemistry**

Fundamentals of sound and ultrasound - cavitation and its principle - instrumentation - homogeneous and heterogeneous processes -sonoluminescence - uses in chemistry, material science, medicine and life - synthetic applications -esterification, sponification,hydrolysis, substitution, cannzaro reaction, stecker's synthesis

### **UNIT-IV : X-ray Diffraction, XPS, EDX and TEM :**

Principle instrumentation and application of X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS) and electron spectroscopy for chemical analysis (ESCA), transmission electron microscopy (TEM), Scanning electron microscopy (SEM).

### **UNIT-V: Computational Chemistry**

**Molecular Modeling:** Introduction – Coordinate Systems – Potential Energy surfaces- Molecular graphics – Surfaces – Mathematical concepts-molecular mechanics. Introduction to non-bonded interactions – electrostatic interactions – van der Waals interactions – Many- body effects in empirical potentials – effective pair potentials – hydrogen bonding in molecular mechanics – force field models for the simulation of liquid water. Computer simulation methods: Introduction – calculation of simple thermodynamic properties – phase space – practical aspects of computer simulation.

### **REFERENCES:**

1. Silverstein and Basallar: Spectroscopic identification of organic compounds.
2. V. M.Parikh: Absorption spectroscopy of organic compounds. ( J. Wiley )
3. D.W. Williams and Flemming: Spectroscopic methods of organic compound.
4. R.C. Kappor and B.S. Agarwal, Principles of polarography, Wiley Eastern Ltd., 1991.
5. <http://www.sjctni.edu/department/CH/ooc/biometrics.ppt>  
[http://www.sjctni.edu/department/CH/ooc/nano preparation.ppt](http://www.sjctni.edu/department/CH/ooc/nano%20preparation.ppt)  
<http://www.sjctni.edu/department/CH/ooc/sonochemistry.ppt>

6. Instrumental Methods of Analysis: Chatwal & Anand
- 7) Principles of Instrumentals Analysis: D.Skoog & West.
8. Andrew R. Leach, Molecular Modelling second edition Pearson Prentice Hall, England 2001.

### Question Pattern

<b>Section-A</b>	<b>Two Question For Each Unit</b>	<b>10x 2 = 20</b>
<b>Section-B</b>	<b>Internal Choice and On Set Of Questions From Each Unit</b>	<b>5x 5 = 25</b>
<b>Section-C</b>	<b>Answer Any Three Out Of 5 Questions and One Questions From Each Unit</b>	<b>3x 10= 30</b>

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course	Hours	Credits						
<b>I</b>	20MPCH1CC2	Resent Trends in Chemistry	4	3						
<b>Course Outcomes (COs)</b>	<b>Programme Outcomes(POs)</b>					<b>Programme Specific Outcomes(PSOs)</b>				
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	✓		✓	✓	✓		✓	✓	✓	✓
<b>CO2</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>CO3</b>	✓		✓		✓	✓	✓	✓	✓	✓
<b>CO4</b>	✓		✓		✓	✓	✓	✓		✓
<b>CO5</b>	✓	✓	✓	✓	✓	✓		✓	✓	✓
Number of Matches(✓) = 42 Relationship: High										

<b>Mapping</b>	1-29%	30-59%	60-69%	70-89%	90-100%
<b>Matches</b>	1-14	15-29	30-34	35-44	45-50
<b>Relationship</b>	Very Poor	Poor	Moderate	High	Very High

**SEMESTER-I**  
**TEACHING AND LEARNING SKILLS**

**Core course: III**

**Credit :4**

**Max.Marks :100**

**Instructional Hours: 6**

**Course Outcomes:**

**Exam Hours : 3**

**Course code: 20MPCH1CC3**

**Internal : 25**

**External : 75**

- To enable the students to develop ICT
- To enable the students to develop multimedia
- To enable the students to detect the types of Pedagogy
- To enable the students to understand about learning analytics
- To develop the students to understand the technical based teaching skills

**Unit I : Computer Application Skills**

Information and 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 - ICT for Professional Development : Concept of professional development; institutional efforts for competency building; individual learning for professional development using professional networks, OERs, technology for action research, etc.

**Unit II : Communications 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 : Pedagogy**

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.

**Unit IV :** E- Learning, Technology Integration and Academic Resources in India Concept and types of e-learning (synchronous and asynchronous instructional delivery and means), m-learning (mobile apps); blended learning; flipped learning; E-learning tools (like LMS; software's for word processing, making presentations, online editing, etc.); subject specific tools for e-learning; awareness of e-learning standards- Concept of technology integration in teaching-learning processes; frameworks guiding technology integration (like TPACK; SAMR); Technology Integration Matrix- Academic Resources in India: MOOC, NMEICT; NPTEL; e-pathshala; SWAYAM, SWAYAM Prabha, National academic depository, National Digital Library; e-Sodh Sindhu; virtual labs; eYantra, Talk to a teacher, MOODLE, mobile apps, etc.

#### **Unit V : Skills of Teaching and Technology based assessment Teaching skills**

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- Technology for Assessment: Concept of assessment and paradigm shift in assessment; role of technology in assessment 'for' learning; tools for self & peer assessment (recording devices; e-rubrics, etc.); online assessment (open source software's; e-portfolio; quiz makers; e- rubrics; survey tools); technology for assessment of collaborative learning like blogs, discussion forums; learning analytics.

#### **References**

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi
2. Brandon Hall , E-learning, A research note by Namahn, found in:  
[www.namahn.com/resources/ .../note-e-learning.pdf](http://www.namahn.com/resources/.../note-e-learning.pdf), Retrieved on 05/08/2011

3. Don Skinner (2005), *Teacher Training*, Edinburgh University Press Ltd., Edinburgh
4. *Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development*, Jonathan Anderson and Tom Van Weert, UNESCO, 2002.
5. Jereb, E., & Šmitek, B. (2006). Applying multimedia instruction in elearning. *Innovations in Education & Teaching International*, 43(1), 15-27.
6. Kumar, K.L. (2008) *Educational Technology*, New Age International Publishers, New Delhi.
7. Learning Management system :  
[https://en.wikipedia.org/wiki/Learning\\_management\\_system](https://en.wikipedia.org/wiki/Learning_management_system) , Retrieved on 05/01/2016
8. Mangal, S.K (2002) *Essential of Teaching – Learning and Information Technology*, Tandon Publications, Ludhiana.
9. Michael, D and William (2000), *Integrating Technology into Teaching and Learning: Concepts and Applications*, Prentice Hall, New York.
10. Pandey, S.K (2005) *Teaching communication*, Commonwealth Publishers, New Delhi.
11. Ram Babu, A abd Dandapani, S (2006), *Microteaching (Vol.1 & 2)*, Neelkamal Publications, Hyderabad.
12. Singh, V.K and Sudarshan K.N. (1996), *Computer Education*, Discovery Publishing Company, New York.
13. Sharma, R.A., (2006) *Fundamentals of Educational Technology*, Surya Publications, Meerut
14. Vanaja, M and Rajasekar, S (2006), *Computer Education*, Neelkamal Publications, Hyderabad.

### Question Pattern

<b>Section-A</b>	<b>Two Question For Each Unit</b>	<b>10x 2 = 20</b>
<b>Section-B</b>	<b>Internal Choice and On Set Of Questions From Each Unit</b>	<b>5x 5 = 25</b>
<b>Section-C</b>	<b>Answer Any Three Out Of 5 Questions and One Questions From Each Unit</b>	<b>3x 10= 30</b>

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
<b>I</b>	20MPCH1CC3	Teaching and Learning skills					4	3			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
<b>CO1</b>	✓		✓	✓	✓		✓	✓	✓	✓	
<b>CO2</b>	✓	✓		✓		✓	✓		✓		
<b>CO3</b>	✓				✓	✓		✓	✓	✓	
<b>CO4</b>			✓		✓		✓	✓			
<b>CO5</b>	✓	✓	✓	✓	✓	✓		✓	✓	✓	
Number of Matches(✓) = 33 Relationship: Moderate											

<b>Mapping</b>	1-29%	30-59%	60-69%	70-89%	90-100%
<b>Matches</b>	1-14	15-29	30-34	35-44	45-50

**SEMESTER-I  
GUIDE PAPER**

**Core course: IV**  
**Credit :4**  
**Max.Marks :100**  
**Instructional Hours: 6**

**Exam Hours : 3**  
**Course code: 20MPCH1CC4**  
**Internal : 25**  
**External :75**

**SYLABUS PREPARED BY GUIDE THEIR OWN RESEARCH AREAS**

**Question Pattern**

<b>Section-A</b>	<b>Two Question For Each Unit</b>	<b>10x 2 = 20</b>
<b>Section-B</b>	<b>Internal Choice And On Set Of Questions From Each Unit</b>	<b>5x 5 = 25</b>
<b>Section-C</b>	<b>Answer Any Three Out Of 5 Questions and One Questions From Each Unit</b>	<b>3x 10= 30</b>