

**M.Phil. CHEMISTRY**

| SEM                | SUB CODE     | COURSE                            | SUBJECT TITLE  | HRS / WEEK | CREDIT    | CIA Mark | ESE MARK | TOTAL MARK |
|--------------------|--------------|-----------------------------------|--|------------|-----------|----------|----------|------------|
| I                  | 20MPCH1CC1   | Core – I                          | Research Methodology   | 4*         | 4         | 25       | 75       | 100        |
|                    | 20MPCH1CC2   | Core – II                         | Advanced Physical Methods and Molecular Modelling in Chemistry   | 4*         | 4         | 25       | 75       | 100        |
|                    | 20MPCH1CC3   | Core – III                        | Teaching and Learning Skills (common paper)  | 4*         | 4         | 25       | 75       | 100        |
|                    | 20MPCH1CC4   | Core - IV (Elective)              | Paper on Topic of Research (The syllabus will be prepared by the Guide and Examination will be conducted by the COE) | 4*         | 4         | 25       | 75       | 100        |
|                    |              | *One hour library for each course |  |            |           |          |          |            |
|                    | <b>TOTAL</b> |                                   |  | <b>16*</b> | <b>16</b> |          |          | <b>400</b> |
| II                 | 20MPCH2PD    |                                   | Dissertation##   | -          | 8         | -        | -        | 200        |
| <b>GRAND TOTAL</b> |              |                                   |  | <b>16</b>  | <b>24</b> |          |          | <b>600</b> |

## Evaluation of the Dissertation and Viva Voce shall be made jointly by the Research Supervisor and the External Examiner.

| Semester | Code       | Course   | Title of the Course  | Hours | Credits | Max. marks | Internal marks | External marks |
|----------|------------|----------|----------------------|-------|---------|------------|----------------|----------------|
| I        | 20MPCH1CC1 | Core – I | RESEARCH METHODOLOGY | 4     | 4       | 100        | 25             | 75             |

### **Course Outcomes (COs):**

At the end of the course, scholars will be able to

- CO1: Apply the principles of research
- CO2: Know the survey of literature using internet resources
- CO3: Report research findings as manuscript and thesis
- CO4: Solve analytical data using statistical approach
- CO5: Apply information technology skills in research

### **Unit - I Principles of Research**

**12 hours**

Definition - 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 Survey of Literature**

**12 hours**

Need for literature survey – Primary, Secondary and Tertiary Sources. Journals, Chemical Abstracts – Subject index, Substance index, Author index, Formula index and other indices. Other similar abstracts for special topics. Current Titles – Reviews – Monographs – Selection of Research topic – Selection of Research Facility – Location of Journals and Articles. Use of computers in the Literature Survey – Websites – Search Engines - chemspider, google scholar, scifinder, scopus, Internet, E-mail. #Scientific Information and Documentation Centers – INSDOC, BANSDOC, NCSI, British Library – Digital Library – e-Journals – e-Content #.

### **Unit - III Assignment, Research Paper and Thesis Writing**

**12 hours**

Assignment – Topic selection, Front Page, Text and References. Research Paper – Preparation of Manuscript for Publication in International Journals Published by Elsevier, Interscience, Wiley and Springer- submission procedure. Thesis - Rough drafting – Title, Abstract, Introduction, Scope of the Work, Literature Review, Problem and Time Limitation, Experimental Methods, Results and Discussion Foot Notes- Data Presentation - Figures and Tables, Sign Conventions followed, bibliography, Conclusion and Recommendations. Abbreviations used. #Storing and Retrieval of Information using Computer – CD, Pen Drive, DVD#.

**Unit – IV Statistical Analysis of Data****12 hours**

Various types of errors – precision and accuracy – significant figures, various statistical tests on the accuracy of results, positive and negative deviation from accurate results – the Gaussian distribution – the normal distribution of random errors, mean value, variance and standard deviation, reliability interval, deviations from the Gaussian law of error distribution, t-tests- comparison of the mean with the expected value, comparison of the results of two different methods, comparison of the precision of two methods by F-test, Gross errors and elimination of outlying results, graphical methods – Linear regression, regression line, <sup>#</sup> standard deviation, correlation coefficient<sup>#</sup>–Multiple Linear regression (one variable with two other variables).

**Unit – V Information Technology Skill****12 hours**

Internet – meaning and importance, types of networking – LAN, WAN and MAN – Internet – www, website and webpage's, mode of connection, network protocols-TCP, IP and HTTP, browsing the internet – browsing softwares, URL addresses, domain name, search engines, exploring websites and downloading materials from websites, E-mail – sending, receiving and storing mail and chatting. Power point – creating a presentation – slide preparation – <sup>#</sup> popular websites for data collection in chemistry<sup>#</sup>.

#..... # Self study

**TEXT BOOKS:**

| S. No. | Author Name                     | Book Name                                    | Edition                 | Publisher detail                      | Year | Units Covered |
|--------|---------------------------------|--|-------------------------|---------------------------------------|------|---------------|
| 1      | C.R. Kothari                    | Research Methodology: Methods & Techniques   | 2 <sup>nd</sup> Edition | Vishwa Prakasan, India                | 2002 | I, II & III   |
| 2      | Scoog, West, Holler and Crouch. | Analytical Chemistry                         | 8 <sup>th</sup> Edition | Thomson – India                       | 2007 | IV            |
| 3      | Zikr – ur Rahman                | Modern Teaching Methods and Techniques       | 1 <sup>st</sup> Edition | Anmol Publication Pvt. Ltd, New Delhi | 2006 | V             |
| 4.     | T. Srinivasan M.                | Use of Computers and Multimedia in Education | 1 <sup>st</sup> Edition | Aavisakar Publication, Jaipur         | 2002 | V             |

## BOOKS FOR REFERENCES

| S. No. | Author Name                            | Book Name                                 | Edition                           | Publisher detail                                       | Year | Units Covered |
|--------|--|---|-----------------------------------|--|------|---------------|
| 1      | J. Anderson, B.H. Durston and M. Poole | Thesis and Assignment Writing             | Reprint                           | John Wiley Publications, Sydney.                       | 1987 | I, II & III   |
| 2      | R. Berry                               | How to Write a Research Paper             | 2 <sup>nd</sup> Edition           | Pergoman, India  | 1986 | III           |
| 3      | R.M. Verma                             | Analytical Chemistry: Theory and Practice | 3 <sup>rd</sup> Edition (Reprint) | CBS Publishers and Distributors, New Delhi             | 2018 | IV            |
| 4.     | K.V. Raman                             | Computers in Chemistry                    | 1 <sup>st</sup> Edition           | Tata McGraw-Hill Publishing company Limited, New Delhi | 2004 | V             |

### Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester                                     | Code                     |     |     |     |     | Title of the Course                |      |      |      |      | Hours | Credits |
|--|--------------------------|-----|-----|-----|-----|------------------------------------|------|------|------|------|-------|---------|
| I  | 20MPCH1CC1               |     |     |     |     | Research Methodology in Chemistry  |      |      |      |      | 4     | 4       |
| Course Outcomes (COs)                        | Programme Outcomes (POs) |     |     |     |     | Programme Specific Outcomes (PSOs) |      |      |      |      |       |         |
|  | PO1                      | PO2 | PO3 | PO4 | PO5 | PSO1                               | PSO2 | PSO3 | PSO4 | PSO5 |       |         |
| CO1  | ✓                        | ✓   | ✓   |     |     | ✓                                  | ✓    |      | ✓    | ✓    |       |         |
| CO2  | ✓                        | ✓   |     | ✓   | ✓   | ✓                                  |      | ✓    | ✓    |      |       |         |
| CO3  | ✓                        |     | ✓   | ✓   |     | ✓                                  | ✓    | ✓    | ✓    | ✓    |       |         |
| CO4  |                          | ✓   | ✓   | ✓   | ✓   |                                    |      |      | ✓    | ✓    |       |         |
| CO5  |                          | ✓   |     | ✓   | ✓   | ✓                                  | ✓    |      | ✓    | ✓    |       |         |
| Number of Matches= 35 Relationship is : High |                          |     |     |     |     |                                    |      |      |      |      |       |         |

Prepared by:  
Dr. K. LOGANATHAN

Checked by:  
Dr. A. JAFAR AHAMED

Note:

|              |           |        |          |        |           |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping      | 1-29%     | 30-59% | 60-69%   | 70-89% | 90-100%   |
| Matches      | 1-14      | 15-29  | 30-34    | 35-44  | 45-50     |
| Relationship | Very poor | Poor   | Moderate | High   | Very high |

| Semester | Code       | Course    | Title of the Course  | Hours | Credits | Max. marks | Internal marks | External marks |
|----------|------------|-----------|--|-------|---------|------------|----------------|----------------|
| I        | 20MPCH1CC2 | Core – II | ADVANCED PHYSICAL METHODS AND MOLECULAR MODELLING IN CHEMISTRY | 4     | 4       | 100        | 25             | 75             |

### **Course outcomes (COs):**

At the end of the course, students will be able to

CO1: Categorize the features of nanomaterials based on their applications.

CO2: Predict the complicated structures using correlation technique

CO3: Deduce the geometry and magnetic properties of inorganic complexes.

CO4: Analyse the molecular interactions by adapting molecular modelling.

CO5: Assess the Drug ability of a molecule by simulation method.

### **Unit I - Characterization and Applications of Nano Materials**

**12 hours**

Surface morphology and nanostructure – Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM) and Atomic Force Microscope (AFM); <sup>#</sup>Structural Characterization - UV-Visible and FT-IR spectroscopy<sup>#</sup>; Structure orientation and micro texture- X-ray Diffraction (XRD); Elemental analysis – Energy Dispersive X-ray Micro analysis (EDX) and Atomic Absorption Spectroscopy(AAS).

Applications of carbon nanomaterials in the field of fuel cells and batteries; Energy and environmental applications- Energy production and storage - Applications of nanomaterials in electronics- semiconductors and chemical sensors, biotechnology- detection of biomolecules and medicine-drug design and drug delivery.

### **Unit II– 2D-NMR and NQR spectroscopy**

**12 hours**

2D- NMR – basic principle and types-homonuclear through-bond correlation methods- Correlation spectroscopy (COSY-  $^1\text{H}$ - $^1\text{H}$  COSY &  $^1\text{H}$ - $^{13}\text{C}$  COSY), Exclusive correlation spectroscopy (E COSY), Total correlation spectroscopy (T COSY), Incredible natural-abundance double-quantum transfer experiment (INADEQUATE)- Heteronuclear through-bond correlation methods-Heteronuclear single-quantum correlation spectroscopy (HSQC), Heteronuclear multiple-bond correlation spectroscopy (HMBC)- Through-space correlation methods-Nuclear Overhauser effect spectroscopy (NOESY), Rotating frame nuclear Overhauser effect spectroscopy (ROESY)-<sup>#</sup> Resolved-spectrum methods-Higher-dimensional methods<sup>#</sup>.

NQR spectroscopy – Characteristics of quadrupolar nucleus – effects of field gradient and magnetic field upon quadrupolar energy levels – NQR transitions – applications of NQR spectroscopy.

**Unit – III –Inorganic Spectroscopy****12 hours**

$^{31}\text{P}$ ,  $^{14}\text{N}$  and  $^{15}\text{N}$  NMR spectra – basic theory, standard reference, chemical shift, coupling constants and biological applications. Combined applications of UV-Visible, FT-IR, Raman and EPR spectral data for solving the structure of metal (Co, Ni, Cu and Zn) complexes-  $^1\text{H}$ -NMR spectra of zinc complexes<sup>#</sup> - Magnetic studies for the characterization of the complexes by VSM.

**Unit -IV Molecular Modelling-I****12-hours**

Molecular Modelling – definition and importance-types of molecular model- spheres, ball-and-stick, skeletal, polyhedral, composite and computer-based models- molecular mechanics- software for molecular mechanics modeling - coordinate systems- potential energy surfaces- molecular graphics- definition, relation with molecular models- <sup>#</sup>non-bonded interactions- electrostatic and van der Waals interactions in molecular modelling<sup>#</sup>- hydrogen bonding in molecular mechanics.

**Unit-V Molecular Modelling –II****12-hours**

Computer simulation methods- definition and advantages- data preparation and process for the preparation of computer simulation model- softwares for simulation- differences between simulation and model- types of simulation models- force field model for the simulations of liquid water-<sup>#</sup>calculation of simple thermodynamic properties, phase space<sup>#</sup>, drug design and delivery using simulating models.

#..... # Self study

**TEXT BOOKS:**

| S. No. | Author Name     | Book Name  | Edition                            | Publisher detail                            | Year | Units Covered |
|--------|-----------------|--|------------------------------------|---|------|---------------|
| 1      | T. Pradeep      | Nano: The Essential Understanding Nanoscience and Nanotechnology | 1 <sup>st</sup> Edition, (Reprint) | Tata McGraw-Hill, New Delhi                 | 2020 | I             |
| 2      | P. S. Kalsi     | Spectroscopy of Organic Compounds                                | 6 <sup>th</sup> Edition            | New Age International Publishers. New Delhi | 2007 | II            |
| 3      | William Kemp    | NMR in Chemistry   | 3 <sup>rd</sup> Edition (Reprint)  | Palgrave, USA                               | 2011 | III           |
| 4.     | R. S. Drago     | Physical Methods in Chemistry                                    | Reprint                            | W. B. Saunders                              | 2017 | III           |
| 5.     | Andrew R. Leach | Molecular Modelling  | 2 <sup>nd</sup> Edition            | Pearson Prentice Hall, England              | 2001 | IV & V        |

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**BOOKS FOR REFERENCES:**

| S. No. | Author Name                               | Book Name                                 | Edition                           | Publisher detail                       | Year | Units Covered |
|--------|---|---|-----------------------------------|--|------|---------------|
| 1      | C. P. Poole Jr and F. J. Ownes            | Introduction to Nano Technology           | 1 <sup>st</sup> Edition           | John Wiley and New Jersey              | 2003 | I             |
| 2      | B. P. Straughan and S. Walker             | Spectroscopy, Vol. 1                      | 1 <sup>st</sup> Edition (Reprint) | Chapman and Hall, UK                   | 2018 | II            |
| 3      | H. Kaur                                   | Spectroscopy                              | 3 <sup>rd</sup> Edition           | Pragati Prakasan Publications, Meerut  | 2006 | II & III      |
| 4      | E. A.V. Ebsworth, W.H. Rankin and Cradock | Structural Methods in Inorganic Chemistry | 2 <sup>nd</sup> Edition           | ELBS                                   | 1991 | III           |
| 5      | Willard, Merrit, Dean and Settle          | Instrumental Methods of Analysis          | 6 <sup>th</sup> Edition           | CBS Publishers and Distributors, India | 1986 | II & III      |
| 6.     | Alan Hinchliffe                           | Molecular Modelling for Beginners         | 2 <sup>nd</sup> Edition           | Wiley Publication, India               | 2008 | IV & V        |

**Mapping:****Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:**

| Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes |                          |     |  |     |     |                                    |      |       |         |      |
|---|--------------------------|-----|--|-----|-----|------------------------------------|------|-------|---------|------|
| Semester  | Code                     |     | Title of the Course  |     |     |                                    |      | Hours | Credits |      |
| I   | 20MPCH1CC2               |     | ADVANCED PHYSICAL METHODS AND MOLECULAR MODELLING IN CHEMISTRY |     |     |                                    |      | 4     | 4       |      |
| Course Outcomes (COs)   | Programme Outcomes (POs) |     |  |     |     | Programme Specific Outcomes (PSOs) |      |       |         |      |
|   | PO1                      | PO2 | PO3  | PO4 | PO5 | PSO1                               | PSO2 | PSO3  | PSO4    | PSO5 |
| CO1   |                          | ✓   | ✓  | ✓   | ✓   | ✓                                  | ✓    |       | ✓       | ✓    |
| CO2   | ✓                        | ✓   | ✓  | ✓   |     | ✓                                  | ✓    | ✓     | ✓       | ✓    |
| CO3   | ✓                        | ✓   | ✓  |     | ✓   | ✓                                  | ✓    | ✓     | ✓       | ✓    |
| CO4   | ✓                        | ✓   | ✓  | ✓   | ✓   |                                    |      | ✓     | ✓       | ✓    |
| CO5   |                          | ✓   | ✓  | ✓   | ✓   | ✓                                  | ✓    | ✓     | ✓       | ✓    |
| Number of Matches=39, Relationship is : HIGH  |                          |     |  |     |     |                                    |      |       |         |      |

Prepared by:

**Dr. M. Purushothaman**

Checked by:

**Dr. M. Syed Ali Padusha**

Note:

|              |           |        |          |        |           |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping      | 1-29%     | 30-59% | 60-69%   | 70-89% | 90-100%   |
| Matches      | 1-14      | 15-29  | 30-34    | 35-44  | 45-50     |
| Relationship | Very poor | Poor   | Moderate | High   | Very high |

| Semester | Code           | Course     | Title of the Course          | Hours | Credits | Max. marks | Internal marks | External marks |
|----------|----------------|------------|------------------------------|-------|---------|------------|----------------|----------------|
| I        | 20MPCH1CC<br>3 | Core – III | TEACHING AND LEARNING SKILLS | 4     | 4       | 100        | 25             | 75             |

### **Course outcomes (COs):**

At the end of the course, students will be able to

CO1: Apply the different types of communication and interaction methods for effective teaching

CO2: Know the concepts of education psychology

CO3: Understand the different kinds of teaching strategies

CO4: Adopt the modern education technologies in teaching

CO5: Provide guidance and counseling for students

### **Unit - I**

**12 hours**

#### **Communication and Interaction**

The theory of communication – communication cycle – Types of communication, communication and language, communication in the class room, Lecture and Lecture demonstration as communication. Interaction methods – Interaction analysis, observation schedule and record. Bale's interaction process categories – Flander's system of interaction analysis – verbal interaction category system. #Reciprocal category system – Equivalent talk categories#.

### **Unit – II**

**12 hours**

#### **Educative Skill**

Psychology – Definition – Nature – Meaning of Educational Psychology – Definition – Nature – Scope. Teaching and learning – meaning – characteristics –effective teaching – concept of learning –comparison between teaching and learning. Mental health – Frustration –# concept of adjustment – Defence mechanism# – Mental hygiene.

### **Unit – III**

**12 hours**

#### **Uses of teaching strategies**

Group methods of instruction – lecture – demonstration – seminars – workshops – case analysis – panel discussion – team teaching – individual approaches – Teleconferencing – Video conferencing – Description – Advantages – Micro teaching –Characteristics of Micro teaching – Teaching skills - Programmed Instruction - Computer Assisted Instruction (CAI) – # Language Laboratory#.

### **Unit – IV**

**12 hours**

#### **Educational Technology**

Educational technology – definition – objectives – teaching technology – characteristics of teaching technology – behavioural technology – pedagogy of teaching – General advantage of using teaching aids – Broad classification of teaching aids – Hardware and software in teaching aids. Instructional media – media attributes – multimedia and instructional development – # Multimedia centre – uses and abuses of multimedia#.



**Unit-V****12 hours****Guidance and Counselling**

Meaning and definition of Guidance and Counselling- need for guidance – aims of guidance- nature of guidance - principles of guidance philosophy- types of guidance- educational, vocational, personal and social guidance- benefits of guidance- benefits to students, teachers, parents community and administrators – role and functions of guidance cell – Counsellor-definition, qualities of a good counsellor, characteristics of counselling, #types of counselling# class teacher as a counsellor- specific duties of a teacher in guidance service, differences between guidance and counselling.

#..... # Self study

**Text Books**

| S. No. | Author Name                       | Book Name  | Edition                 | Publisher detail                            | Year | Units Covered   |
|--------|-----------------------------------|--|-------------------------|---|------|-----------------|
| 1      | Zikr – ur Rahman                  | Modern Teaching Methods and Techniques                         | 5 <sup>th</sup> Edition | Anmol Publications Pvt Ltd, New Delhi       | 2005 | I, II, III & IV |
| 2      | R. A. Sharma                      | Educational Technology and Management Models Media and Methods | 1 <sup>st</sup> Edition | R. Lall Book Depot. Meerut                  | 2011 | I, II & IV      |
| 3      | Vanaja                            | Educational technology   | 7 <sup>th</sup> Edition | Neel Kamal publications Pvt. Ltd. Hyderabad | 2016 | IV & V          |
| 4.     | K. Nagarajan and Deva Seetharaman | Psychology of learning and Human Development                   | 2 <sup>nd</sup> Edition | Sriram Publishers, Chennai                  | 2014 | IV & V          |

### Books for References

| S. No. | Author Name                                   | Book Name   | Edition                         | Publisher detail                             | Year | Units Covered   |
|--------|---|---|---------------------------------|--|------|-----------------|
| 1      | B. N. Dash                                    | Elementary Educational Psychology and Methods of Teaching | 1 <sup>st</sup> Edition         | Neel Kamal publications Pvt. Ltd., New Delhi | 2007 | I, II, III & IV |
| 2      | P. Sambasiva Rao and D. Bhaskar Rao           | Techniques of Teaching Psychology                         | 1 <sup>st</sup> Edition         | Sonali Publications, New Delhi               | 2006 | I, II & III     |
| 3      | S. K. Kochhar                                 | Methods and Techniques of Teaching                        | 1 <sup>st</sup> Edition         | Sterling Publisher Pvt. Ltd, New Delhi       | 2013 | I & III         |
| 4.     | K. Sampath, A. Panner selvam and S. Santhanam | Introduction to Educational Technology                    | 4 <sup>th</sup> Revised edition | Sterling Publisher Pvt. Ltd                  | 2000 | IV & V          |
| 5.     | S. Robinson                                   | Fundamentals of Education Psychology                      | 2 <sup>nd</sup> Edition         | Ane Books Pvt. Ltd                           | 2008 | IV              |
| 6.     | T.M. Srinivasan                               | Use of Computers and Multimedia in Education              | 1 <sup>st</sup> Edition         | Aavisakar publication, Jaipur                | 2002 | IV              |

**Web References:** [https://swayam.gov.in/nd2\\_ntr20\\_ed21/preview](https://swayam.gov.in/nd2_ntr20_ed21/preview)

Mapping:

### Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester                                      | Code                     |     |     |     |     | Title of the Course                |      |      |      |      | Hours | Credits |
|---|--------------------------|-----|-----|-----|-----|------------------------------------|------|------|------|------|-------|---------|
| I   | 20MPCH1CC3               |     |     |     |     | TEACHING AND LEARNING SKILLS       |      |      |      |      | 4     | 4       |
| Course Outcomes (COs)                         | Programme Outcomes (POs) |     |     |     |     | Programme Specific Outcomes (PSOs) |      |      |      |      |       |         |
|   | PO1                      | PO2 | PO3 | PO4 | PO5 | PSO1                               | PSO2 | PSO3 | PSO4 | PSO5 |       |         |
| CO1   | ✓                        | ✓   | ✓   | ✓   | ✓   | ✓                                  |      | ✓    | ✓    | ✓    |       |         |
| CO2   | ✓                        | ✓   | ✓   |     | ✓   | ✓                                  | ✓    | ✓    | ✓    |      |       |         |
| CO3   | ✓                        | ✓   | ✓   | ✓   | ✓   | ✓                                  | ✓    | ✓    | ✓    | ✓    |       |         |
| CO4   | ✓                        | ✓   | ✓   | ✓   | ✓   | ✓                                  |      | ✓    | ✓    | ✓    |       |         |
| CO5   | ✓                        | ✓   | ✓   |     | ✓   | ✓                                  | ✓    | ✓    |      | ✓    |       |         |
| Number of Matches= 44, Relationship is : High |                          |     |     |     |     |                                    |      |      |      |      |       |         |

Prepared by:

Dr. J. SIRAJUDEEN

Note:

Checked by:

Dr. A. ZAKIR HUSSIAN

|              |           |        |          |        |           |
|--------------|-----------|--------|----------|--------|-----------|
| Mapping      | 1-29%     | 30-59% | 60-69%   | 70-89% | 90-100%   |
| Matches      | 1-14      | 15-29  | 30-34    | 35-44  | 45-50     |
| Relationship | Very poor | Poor   | Moderate | High   | Very high |

