



RK University (Pre-registration coursework for PhD program)

Program - PhD (Chemistry)

Concerned Dean - Dr. T. R. Desai (email - trdesai@rku.ac.in)

Sr. No.	Subject	Contents	Method of evaluation	Credits
1.	Research methodology	As specified	Written examination (3 hrs)	4
2.	Spectroscopy and Instrumental techniques	As specified	Written examination (3 hrs)	4
3.	Review work	Review of literature for the PhD research topic	Presentation + Detailed report in hard copy	3
Total				11

Notes -

1. The admission process of PhD program will comprise of 2 stages viz. (a) admission to PhD program (b) final registration in PhD program.
2. A successful PhD candidate (RAT examination) will be admitted to PhD program after paying admission fees (Rs. 60000/-) and upon allocation of a PhD guide by RK University.
3. An admitted PhD candidate will have to submit synopsis and presentation of his/her actual research project (in consultation with the PhD guide approved and allocated by RK university) before Doctoral Research Committee (DRC) within 6 months from date of admission (date will be declared by university).
4. An admitted PhD candidate will be registered after earning minimum of 11 credits as per above mentioned course-work structure.
5. The candidate will acquire credit of a subject on passing the examination that will be conducted at the end of 6 months (date will be declared by university).
6. On acquiring required credits, an admitted candidate will be issued a certificate of registration (along with project title) by RK University.

Course Title	Research Methodology
Detailed syllabus	
<p>A Research: Meaning, purpose, Types, (Educational, Clinical, Experimental, historical descriptive, Basic applied and Patent oriented Research) and objectives of research, phases of research.</p> <p>B Research Design: Review of Research Literature: Purpose and use of literature review, locating relevant information, use of library & electronic databases, preparation & presentation of literature review, research article reviews, theoretical models and frame work. Identification of gaps in research, formulation of research problem, definition of research objectives.</p> <p>C Documentation:</p> <ol style="list-style-type: none"> a. –How of documentation b. Techniques of documentation c. Importance of documentation d. Use of computer packages in documentation <p>D Research Publication: Thesis, Research paper, Review Article & Technical Reports: Organization of thesis and reports, formatting issues, citation methods, references, effective oral presentation of research. Quality indices of research publication: impact factor, immediacy factor, H- index and other citation indices.</p> <p>E Presentation (especially for oral presentation): Importance and types of different skills, contained, format of model, introduction, Poster, Gestures, eye contact, facial, expressions, stage fright, volume of pitch, speed, pause & language, Visual aids & seating, Questionnaire etc.</p> <p>F Cost analysis of the project: Cost incurred on raw materials, Procedure, instrumentations and clinical trials.</p> <p>G Sources for procurement of research grants: International agencies, government and private bodies.</p> <p>H Industrial-institution interaction: Industrial projects, their feasibility reports, interaction with industries.</p> <p>I Research Ethics and Morals: Issues related to plagiarism, collaborative models and ethics, acknowledgements. Intellectual Property Rights: copy rights, copy left: patents, Industrial designs, Trademarks.</p>	

Reference Books:

1. Research Methodology, Methods & Techniques, C.R. Kothari, Viswa Prakashan, 2nd Edition, 2009.
2. Research Methods- A Process of Inquiry, Graziano, A.M., Raulin, M.L, Pearson Publications, 7th Edition, 2009.
3. How to Write a Thesis:, Murray, R. Tata McGraw Hill, 2nd Edition, 2010.
4. Writing For Academic Journals, Murray, R., McGraw Hill International, 2009.
5. Writing for Publication, Henson, K.T., Allyn & Bacon, 2005.
6. What is this thing called Science, Chalmers, A.F., Queensland University Press, 1999.
7. Methods & Techniques of Social Research, Bhandarkar & Wilkinson, Himalaya publications, 2009.
8. Doing your Research project, Bell J., Open University Press, Berkshire, 4th Edition, 2005.
9. A Handbook of Academic Writing, Murray, R. and Moore, S., Tata McGraw Hill International, 2006

Course Title	Spectroscopy and instrumental techniques
Detailed syllabus Section I Spectroscopy	
<ul style="list-style-type: none"> <li> <p>• UV Spectroscopy: Theory and principles of electronic transition and UV absorption, chromophores and auxochromes, Woodward-Fieser rules for dienes and enones, characteristic absorptions in organic compound. Effects of conjugation. Characteristic absorptions in aromatic compounds.</p> <li> <p>• Infrared Spectroscopy: Theory and principles, Instrumentations, molecular vibrations and calculations of vibrational frequencies, characteristic group absorptions in hydrocarbons, aromatic compounds, alcohol and phenols, ethers, carbonyl compounds, amines, nitriles, nitro compounds, carboxylic acids and halide.</p> <li> <p>• NMR Spectroscopy:</p> <p>¹H NMR Spectroscopy: Proton resonance condition, aspects of PMR spectra – number of signals, chemical shifts, shielding and deshielding, diamagnetic anisotropy, factors affecting chemical shifts, peak area and integration, splitting of the signals – spin spin coupling, coupling constants – vicinal, germinal, long range and virtual couplings, chemical shift equivalence and magnetic equivalence, first order and second order spectra, complex PMR spectra.</p> <p>¹³C NMR Spectroscopy: Difficulties and solution for recording ¹³C NMR spectra, recording of ¹³C- NMR spectra – scale, solvents, solvent signals and their positions, multiplicity, ¹³C-¹H coupling constant – proton coupled and decoupled ¹³C spectra, broad band decoupling. 2D NMR Spectroscopy: Theory and principles of 2D NMR spectroscopy.</p> <li> <p>• MASS Spectroscopy: Theory and principles of mass spectroscopy, Instrumentation, low and high resolution mass spectra, Ionization techniques – Electron Impact (EI) ionization, Chemical Ionization (CI), Field Desorption (FD), Fast Ion Bombardment (FAB), Electron spray Ionization (ESI) and Matrix Assisted Laser Desorption/Ionization (MALDI). Determination of molecular weight and molecular formula, nitrogen rule, detection of molecular ion peak, metastable ion peak. Fragmentations –rules governing the fragmentations, Interpretation of mass spectra of different class of compounds.</p> 	

Section II

Instrumental Techniques (Chromatography)

- **Gas Chromatography :**
Principle, Theory and Instrumentation, Solid/Liquid Stationary phases, Column types ,Detectors, Applications

- **High Performance Liquid Chromatography (HPLC):**
Principle, Theory and Instrumentation, Column types, Detectors, Applications.

- **TLC and HPTLC**
Principle, Instrumentation, Applications.

- **Ion exchange Chromatography**
Principle, Theory and Instrumentation, Applications.

Reference Books:

1. Spectrometric Identification of organic Compounds, R.M. Silverstein, G.C. Bassler and T.C. Morrill, John Wiley.
2. Spectroscopy of Organic Compounds, P.S.Kalsi, 5th edition, New age international publishers
3. Organic Spectroscopy, William Kemp, 3rd edition ,Palgrave
4. Instrumental method of chemical analysis, B. K. Sharma, 4th edition, GOEL publishing house Meerut
5. Application of Spectroscopy of Organic Compounds, J. R. Dyer, Prentice Hall.
6. Spectroscopy Methods in Organic Chemistry, D. H. Williams, I. Fleming, Tata McGraw-Hill.
7. Vogel's Textbook of Quantitative Chemical Analysis, G. H. Jeffery, J. Bassett, J. Mendham and C. Denney, Longman Singapore Publisher Pvt. Ltd. (Singapore).
8. Principles of Instrumental Analysis, Skoog, Holler and Neiman, Sanders College Publishers (USA)
9. Introduction to Instrumental Analysis, Robert D. Braun, Pharma Med Press Hyderabad- India.