



**Birla Institute of Technology & Science, Pilani**  
Pilani | Dubai | Goa | Hyderabad

# **Guidelines for submission of DOCTORAL RESEARCH PROPOSAL**

**Academic Research (Ph. D. Programme) Division**

Birla Institute of Technology and Science, Pilani

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## **INTRODUCTION**

This brochure attempts to provide essential guidelines to Ph.D. candidates for preparation of their Research Proposal for consideration of the Research Board of the Institute. As per the provisions of the Academic Regulations, a Ph.D. student after passing the Qualifying Examination has to submit a detailed outline of the proposed topic of research with the concurrence of the proposed supervisor to the Research Board.

### **Research Board**

In all matters where the student has to approach the Research Board, applications must invariably be submitted through Dean, ARD who will assist the Research Board with supporting documents and his recommendation consistent with the regulations, the Institute's research goals, facilities available and other pertinent factors.

### **Application procedure**

The applications are to be addressed to the Chairman, Research Board, through Dean, ARD. The procedure for application is given in the guidelines document (for on campus or off campus students, available at Important Proformas and Guidelines section of <http://www.bits-pilani.ac.in/university/AcademicResearch/Overview>).

For research proposal submission, initially two hard copies (of summary and proposal document) have to be submitted. However, for final submission, one hard copy (of summary and proposal document) and one softcopy in a CD (summary and proposal document as separate doc files) along with relevant appendices have to be submitted to ARD. Simply submitting the research proposal does not make it fit for acceptance in the research board. Normally the process given below is followed before the research proposal is finalized to be put in the research board:

#### **1. For on-campus candidates:**

Once a Ph.D. student clears the required qualifying examination, he/she, in consultation with his/her notional supervisor and the DAC members will decide upon the topic, the co-supervisor (if required), prepare a research proposal and submit it to DRC. DRC will send it to DAC members for review. The candidate has to make corrections as per the suggestions of DAC members and will make an oral presentation before the DAC, DRC members and others in the department concerned. Based upon DAC recommendation, the DRC will recommend to Dean ARD, through Professor-in-Charge ARD for approval of (i) supervisor (and

co-supervisor), (ii) the research topic together with the detailed proposal and its summary, (iii) the research plan, and (iv) place of research work, as per requirement.

**2. For off-campus aspirants:**

The off-campus candidate, in consultation with his/her supervisor(s), will decide upon the topic, prepare a detailed research proposal and send it to ARD. It will be forwarded to DRC by ARD. The DAC members will review it and the candidate has to make corrections as per the suggestions of DAC members. If necessary DRC will request the candidate to present the proposal orally also in the form of seminar. Based upon DAC recommendation, the DRC will recommend to ARD for approval of (i) supervisor and co-supervisor, (ii) the research topic together with the detailed proposal and its summary, (iii) the research plan, and (iv) place of research work, as per requirement.

Final submission from DRC does not guarantee that proposal will be approved in Research Board. Research Board generally meets in the month of May and December. The decision of Research Board is communicated to the candidates.

**Appendices to be submitted:**

**Appendix – 1**

Kindly refer the format given in Annexure section. Appendix-1 is essential for all candidates (on campus as well as off campus). In case the candidate takes a co-supervisor(s) then appendix-1 needs to be signed by the co-supervisor(s) too.

**Appendix-2**

It has two parts, 'summary of the research proposal' and 'research proposal'. The formats for the same are given in Annexure section and should be neatly word-processed for the purpose of reproduction.

**Appendix-3 and Appendix-4**

If the proposed supervisor/ co-supervisor(s) is not a faculty member of BITS, his bio-data in duplicate along with consent of his/her organization in the formats given in Annexure section should also be submitted along with the Application.

We normally encourage that the supervisor should be from the same organizations as of the candidate or else ensure that, at least the supervisor is located in the same city as that of the candidate. The candidate can choose the co-supervisor(s) from any Indian campus of BITS, Pilani.

## **Appendix-5**

For candidates desirous of working as off-campus students, consent of the organization, proposed to be the place of work, for providing all facilities for research should also be obtained and enclosed with the application. (Format given in annexure section).

### **Typical research proposal**

Some examples of typical summary and research proposal are given as Appendix-6 (Annexure section). Candidates may consult these before preparing their own proposal.

## **GUIDELINES FOR PREPARATION OF RESEARCH PROPOSAL**

### **A. Summary**

Summary page should not exceed one page. It has following subtitles.

1. (a) Name and ID No.  
(b) Place of Research work and Organization
2. (a) Proposed Supervisor & Qualification  
(b) Designation and Organization
3. Proposed Topic of Research (Max. 25 words)
4. Objective of the Proposed Research (Max. 25 words)
5. Background (Max. 100 words)
6. Methodology (Max. 100 words)
7. Expected Outcome (Max. 50 words)

### **B. Outline of the Proposed Topic of Research**

The purpose of the research proposal is to describe clearly and precisely the nature and scope of the research program. The outline of the proposed topic of research should include the following

#### **1. Proposed Topic of Research**

It specifies the area of the proposed research work and is not the exact title of the thesis. Title of the thesis emerges at a stage when the candidate is almost ready to submit his/her thesis. Before submitting the thesis, exact title which will appear on the thesis, has to be approved by the DCC. The proposed topic of research should be written in "Title Case" and should not be too lengthy.

## **2. Objective of the Proposed Research:**

It should be clearly indicating the perception of the research work and should not be a mere repetition of the topic of research. What is to be achieved as an outcome of the research has to be visualized while mentioning the objective of the research. Objective should be given point wise (3-4 points) as shown in the 'A Typical Research Proposal' (annexure-6).

## **3. Background of the Proposed Research:**

This is normally prepared after the candidate has studied the contemporary literature and researches done in the same area as available from current research journals, published reports of the organizations, issues needing research and enquiry in any area of activity of the organization, etc. It is expected that a broad summary of the present status of work and unresolved academic issues in the area are highlighted while giving the background of the proposed research. To identify the research gap, the candidate should refer latest peer-reviewed journal articles.

It is important to make clear the impact of the proposed research and the particular aspect of the problem that is anticipated to produce an original contribution(s) by the candidate. The background of his proposed research should include the following parts:

### **Introduction (250-300 words)**

In this subsection, importance of subject area on of proposed topic of research can be written.

### **Literature Review of Research Topic (1500-2000 words)**

Present Status of "Topic of Research" from existing literature can be written in this part of proposal

### **Gaps in existing Research**

Unresolved issues on the topic of research and their importance of the proposed project in the context of current status are to be given in this part. Furthermore, possible utilization of research outcome can also be suggested.

## **4. Methodology**

In the first paragraph of methodology, provide experimental/infrastructural/ computing facilities which are necessary to carry out proposed research work. Then describe the logical phases, which are to be followed in investigating the current problem.

- Methodology should be given phase-wise and brief explanation should be given under each phase (4-5 sentences under each phase).

- Phase-1 will be literature survey and last phase will be conclusions and thesis writing. In between these phases, candidate can identify suitable phases relevant to the topic of research.

### 5. Work Plan

The work plan (activity schedule) and the time by which these are to be achieved are to be indicated in the form of horizontal bar chart. Please refer to ‘Sample Proposals’ to see as to how the work plan should look like.

### 6. References

The citation of literature should be done in a standard manner in the text of ‘Background of Proposed Research’. Please refer to “A Typical Research Proposal (annexure-6)” to see as to how the references are cited in the text.

### 7. Brief Bio-data of the supervisor (Not required for internal candidates)

On last page of the proposal, brief bio-data of the supervisor should be provided on a separate page after the reference section, in the table form as follows:

Name of the Candidate	
I.D. of Candidate	
Name of the Supervisor	
Qualification of Supervisor	
Present Designation & Organization	
Area of Research	
Work Experience (Years)	
Number of publications	
Number of Ph.D students supervised	

### POINTS TO CONSIDER FOR FORMATTING THE PROPOSAL

Page Orientation	Portrait
Page Size	Letter or A4 size
Margins	1 inch from all sides
Headings	Times New Roman, Bold, Size-14 points, Title case
Sub-Headings	Times New Roman, 12 points, Bold
Body-text (paragraphs)	Times New Roman, 12 points, Justified

- Paragraphs of the text should be justified
- Each page of proposal has to be given page number at bottom & at center as in Arabic (1,2,3 ....etc.) numerical
- The proposal should only be long enough to present the necessary information. The length will depend on the nature of the problem, but approximately 10-12 pages (spacing: 1.5 lines) are usually sufficient.
- Proposal should be stapled and NOT TO BE BOUND (spiral or otherwise)
- Check your proposal against checklist provided at the end of this document.
- Tables and figures should be only used only if relevant and absolutely necessary. If included please follow the instructions given below:

#### **Tables**

- Number tables consecutively in the order of their first citation in the text and supply a brief title for each. Give each column a short or abbreviated heading.
- Be sure to give caption to each table and they are cited in the text.
- Table footnotes are to be avoided.
- If a Table has been published, cite the original source.

#### **Illustrations (Figures)**

- Letters, numbers, and symbols on Figures should be clear and uniform throughout, and of sufficient size so as to make legible.
- Figures should be made as self-explanatory as possible
- Be sure to give caption to each Figure and all figures are cited in the text.
- Figures should be numbered consecutively according to the order in which they have been first cited in the text.
- If a figure has been published, cite the original source.

#### **Units of Measurement**

- Measurements of length, height, weight, and volume should be reported in consistently throughout the proposal.

#### **Abbreviations and Symbols**

- Use only standard abbreviations. Avoid abbreviations in the title. The full term for which an abbreviation stands should precede its first use in the text except in case of measurement units.

### **Important points related to References**

- Reference list should identify references cited (eg. book, journal article, conference proceedings, dissertations, theses etc.) in sufficient detail so that others may locate and consult your references.
- Reference list should appear at the end of your report with the entries listed numerically and in the same order that they have been cited in the text.
- It is important to BE CONSISTENT when you are referencing
- References should contain all the necessary parts. No part should be missing.
- Sequence of the part of reference citation should be uniform for all the reference of same type.

To maintain consistency in reference formatting candidate should follow guideline as given below:

### **In-text citations**

- The identification of references within the text of your proposal by arabic (i.e. 1, 2...etc) numbers in square brackets. This applies to references in text, tables and figures.
- The original number assigned to the reference is reused each time the reference is cited in the text, regardless of its subsequent position in the text.
- When multiple references are cited at a given place in the text, use a hyphen to join the first and last numbers that are inclusive. Use commas (without spaces) to separate non-inclusive numbers in a multiple citation e.g. [2-5, 7, 10].
- The placement of citation numbers within text should be carefully considered, for example, a particular reference may be relevant to only part of a sentence. As a general rule, reference numbers should be placed, inside colons, semicolons, full-stops and commas. e. g. There have been efforts to replace mouse inoculation testing with in vitro tests, such as enzyme linked immunosorbent assays [5, 6] or polymerase chain reaction [7-10].

### **Reference List**

A list of references contains details only of those works cited in the text. Punctuation marks and spaces within the references are very important. Keep uniformity with this respect.

Also consider the following:

1. Minimum 12 to 20 references are needed
2. References should be written as per the format given.

3. 50-60 % references are needed are to be from reputed journal articles, that too from latest journals. For examples if you are writing a proposal in 2012, 70% articles should be published after 2007.
4. In case of conference proceedings dates, place of the conference and in case of published proceedings page nos. of proceedings should be given.
5. Citation dates for e-reference is a must.
6. Give the editions of the books referred by you.
7. Give full details of the reports taken as a reference i.e. place of publication, published by which agency, etc.

### **Format for the Reference Section**

#### **Journal article:**

Neumann T., Ermert H. "Schlieren visualization of ultrasonic wave fields with high spatial resolution" *Journal of Ultrasonics*. 2006, 44: 561-566.

#### **If Organization is the author**

Diabetes Prevention Program Research Group "Hypertension, insulin, and proinsulin in participants with impaired glucose tolerance" *Hypertension*. 2002, 40:679-686.

#### **Books**

Goodman G. A. "*The Pharmacological Basis of Therapeutics*" 10th ed. McGraw Hill, New York, USA. 2001, 3-29.

#### **If Book has both Author(s) and Editor(s)**

Johnson D. B., Maltz D. A., Broch J. "*DSR: The dynamic source routing protocol for multi-hop wireless ad hoc networks*" C.E. Perkins (Ed.), *Ad Hoc Networking*, Addison-Wesley, Reading, USA. 2001, 139-172.

#### **If Organization is the Author of Book**

Royal Adelaide Hospital: Department of Clinical Nursing, University of Adelaide, *Compendium of nursing research and practice development*, 1999-2000. Adelaide (Australia): Adelaide University; 2001.

#### **Chapter in a Book**

Meltzer P. S., Kallioniemi A., Trent J. M. "Chromosome alterations in human solid tumors" In: *The genetic basis of human cancer*. (Vogelstein B., Kinzler K.W., Eds.), McGraw-Hill, New York, USA. 2002, 93-113.

### **Conference Proceedings**

1. Martinola G., Bauml M. F. "Optimizing ECC in Order to Prevent Shrinkage Cracking. Proceedings of the JCI International Workshop on Ductile Fiber Reinforced Cementitious Composites (DFRCC) - Application and Evaluation, Takayama, Japan, 2002, Oct 21-22, 143-152.
2. Xiang G., Boulton T. E., Coetzee F., Ramesh V. "Error Analysis of Background Adaptation" Proceedings of IEEE Computer Society Conference on Computer Vision and Pattern Recognition, South Carolina, USA, 2000, Jun 13 – 15, IEEE, 2000, 1: 503-510.

### **Scientific or Technical Report**

1. Russell M. L., Goth-Goldstein R., Apte M. G., Fisk W. J., *Method for measuring the size distribution of airborne Rhinovirus*. Berkeley (CA): Lawrence Berkeley National Laboratory, Environmental Energy Technologies Division; 2002 Jan. Report No.: LBNL49574. Contract No.: DEAC0376SF00098. Sponsored by the Department of Energy.
2. National Manufacturing Competitive Council, *The National Strategy for Manufacturing* Government of India Report, 2006

### **Patent**

Pagedas A. C., inventor; Ancel Surgical R&D Inc., assignee. *Flexible endoscopic grasping and cutting device and positioning tool assembly* United States Patent US 20020103498, 2002 Aug 1.

### **CD-ROM**

Anderson S. C., Poulsen K. B., *Anderson's electronic atlas of hematology* [CD-ROM]. Philadelphia, USA. Lippincott Williams & Wilkins; 2002.

### **Journal article on the Internet**

1. Ruchir S., Bhardwaj V., Manoj M. "On the Design of Adaptive and De-centralized Load Balancing Algorithms with Load Estimation for Computational Grid Environments" 2002 Jun [cited 2002 Aug 12]  
Available from:  
<http://ieeexplore.ieee.org/iel4/5485/14764/00669970.pdf?arnumber=66997>
2. Rodrigo J.G., Lopes A.M.T., Silva R.M., Ferreira Q., *Kinetic Modeling and Trickle-Bed CFD Studies in the Catalytic Wet Oxidation of Vanillic Acid* Industrial Engineering Chemistry Research, 2007 Aug [cited 2007 Sep].  
Available from:  
<http://pubs.acs.org/cgi-bin/abstract.cgi/iecred/asap/abs/ie070009a.html>.

### **Monograph on the Internet**

Foley K.M., Gelband H., editors. *Improving palliative care for cancer* [monograph on the Internet]. Washington: National Academy Press; 2001 [cited 2002 Jul 9].

Available from: <http://www.nap.edu/books/0309074029/html>

### **Database on the Internet**

Jablonski S., Online *Multiple Congenital Anomaly/Mental Retardation (MCA/MR) Syndromes* [database on the Internet]. Bethesda (MD):National Library of Medicine (US). c1999 [updated 2001 Nov 20; cited [2002 Aug 12].

Available from: [http://www.nlm.nih.gov/mesh/jablonski/syndrome\\_title.html](http://www.nlm.nih.gov/mesh/jablonski/syndrome_title.html)

### **PhD Dissertation/ Thesis**

1. Klamecki, B.E., *Incipient Chip Formation in Metal Cutting - A 3-D Finite Element Analysis* Ph.D. Dissertation, Univ. of Illinois at Urbana Champaign, USA, 1973.
2. Zhuang X., *Compiler Optimizations for Multithreaded Multi-core Network Processors* [PhD. Thesis], Georgia Institute of Technology, USA, 2006.

**ANNEXURES**  
**APPENDIX- 1**

The Chairman  
Research Board  
BITS, Pilani.

Sub: Topic of Research and Supervisor Approval.

Through: Dean, ARD

Dear Sir,

Enclosed herewith is the detailed outline of the proposed topic of research for my Ph.D. Programme, for consideration of the Research Board. The proposed topic of the research is:

\_\_\_\_\_

\_\_\_\_\_

I propose the following as my Supervisor

\_\_\_\_\_

And co-supervisor:

\_\_\_\_\_

Date of passing the Ph.D. Qualifying Examination: \_\_\_\_\_

The following place and organisation for my research work may also be approved:

Place: \_\_\_\_\_

Organisation: \_\_\_\_\_

Yours faithfully,

(Signature of the student)

Full Name: \_\_\_\_\_

ID No. : \_\_\_\_\_

Date: \_\_\_\_\_

(P.T.O)

Recommendations of the Proposed Supervisor(s):

I have scrutinized the proposed topic of research and I agree to act as his supervisor. I shall conduct thesis and other components of the Ph.D. programme of the candidate as per provisions of the Academic Regulations of BITS. As regards the foreign language requirements, I recommend that for the proposed topic of research (tick appropriate box (s) below):

- English language would be adequate  
 Another modern European language would be necessary.

Name of language is \_\_\_\_\_

- Another Indian Language would be necessary

Name of Indian Language is \_\_\_\_\_

(Only for Ph.D. in Indian Language/Literature)

Date: \_\_\_\_\_

(Signature of proposed supervisor)

Date: \_\_\_\_\_

(Signature of proposed co-supervisor)

-----  
Recommendations of the Dean, ARD

Date: \_\_\_\_\_

(Dean, ARD)  
-----

1. **In case of a candidate having more than one co-supervisor please add the necessary details in this form**
2. If the proposed supervisor/ co-supervisor(s) is not a BITS Faculty, his bio-data should be submitted in the prescribed format (Appendix-3)

## APPENDIX – 2

### A. Summary

#### Summary of the Research Proposal

1. (a) Name and ID No.  
(b) Place of Research work and Organization
2. (a) Proposed Supervisor & Qualification  
(b) Designation and Organization
3. Proposed Topic of Research (Max. 25 words)
4. Objective of the Proposed Research (Max. 25 words)
5. Background (Max. 100 words)
6. Methodology (Max. 100 words)
7. Expected Outcome (Max. 50 words)

### B. Outline of the Proposed Topic of Research

#### Outline of the Proposed Topic of Research

Name of Candidate:

ID No. :

Place of Research Work and Organisation:

Proposed Supervisor's Details (Also, add Proposed Co-supervisor's Details if applicable)

Name:

Qualification:

Designation:

Organisation:

1. **Proposed Topic of Research**
2. **Objective of the Proposed Research**
3. **Background of Proposed Research**
  - a. **Introduction**
  - b. **Literature Review of Research Topic**
  - c. **Gap in Existing Research**
4. **Methodology**
5. **Work Plan**
6. **References**
7. **Brief Bio-data of the supervisor**

### APPENDIX – 3

#### FORMAT FOR SUPERVISOR'S BIODATA

1. Name
2. Present Designation, official address, telephone number & e-mail address
3. Permanent Address
4. Date of birth
5. Education (starting with high school/higher secondary, list all examinations passed, degrees obtained, dates and institutions/universities from which obtained).
6. Academic distinctions attained
7. Professional career beyond Master's degree to present date in chronological order (list all appointments and posts held, nature of the work done)
8. Broad field of research interests with specific areas of involvement.
9. Publications: give titles of papers, names of journals and dates of publications
10. Type of industrial and consultancy work done
11. Patents obtained
12. Visits abroad and nature of assignment
13. Membership of professional societies
14. Doctoral degrees thesis already supervised, if any (list titles)
15. Number of Ph.D. candidates, if any, currently registered under him along with university details
16. State in what manner connected with candidate's organization and proposed place of work.

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For functions of Ph.D. Supervisor/Co-supervisor, please refer to guidelines

**APPENDIX – 4**

**CONSENT OF SUPERVISOR'S/ CO-SUPERVISOR'S ORGANISATION PERMITTING HIM TO ACT AS SUPERVISOR**

*(To be provided on the letterhead or put the official seal of the signing official)*

**CERTIFICATE**

This is to inform that we have no objection in case our Shri/Dr \_\_\_\_\_ (Name of the Proposed Supervisor) Designation \_\_\_\_\_ extends assistance and supervision to Shri/Ms.

\_\_\_\_\_ in his/her research work towards Ph.D. degree of BITS (Name of Student) on the topic \_\_\_\_\_

Date:

Head/Controlling Officer of the Organisation

**APPENDIX – 5**

**Consent of the Organisation proposed as Place of Research Work**

*(To be provided on the letterhead or put the official seal of the signing official)*

**CERTIFICATE FROM THE ORGANISATION**

Shri/Ms. \_\_\_\_\_ registered in the Ph.D. programme of BITS, Pilani is permitted to carry out his/her research work at \_\_\_\_\_ (Name of the organization and place). The necessary infrastructural and technical facilities needed for his/her research work are available and are accessible to him/her. The proposed research work by the candidate will professionally benefit the organization.

Date:

Head/Controlling Officer of the Organization

## ANNEXURE-6

### A. Typical summary

#### Summary of the Research Proposal

- |  |  |
|--|--|
| <b>1. a. Name and ID No.</b>                         | Meena Purohit<br>2006PH08145P  |
| <b>b. Place of Research work and Organization</b>    | Department of Chemistry and<br>Biochemistry University of North<br>Carolina at Greensboro, USA                         |
| <b>2. a. Proposed Supervisor &amp; Qualification</b> | Dr. Lakshmi P. Kotra, Ph.D.  |
| <b>b. Designation and Organization</b>               | Associate Professor, Department of<br>Chemistry and Biochemistry<br>University of North Carolina at<br>Greensboro, USA |

### 3. Proposed Topic of Research

Investigation of the structure-activity relationships of novel purine and pyrimidine nucleotide derivatives targeting orotidine -5'-monophosphate decarboxylase (ODCase).

### 4. Objective of the Proposed Research

To design libraries of pyrimidine and purine nucleotides with structural variations in nucleic base and sugar moieties and to build structure-activity relationships for the inhibition of the catalytic activity of orotidine -5'-monophosphate decarboxylase (ODCase).

### 5. Background

ODCase is one of the most proficient enzymes known which is involved in the catalysis of decarboxylation of orotidine-5'-monophosphate (OMP) to uridine-5'-monophosphate (UMP) in the last step in the de novo biosynthesis of pyrimidine nucleotides. Malaria parasite lacks pyrimidine salvage pathway. Due to ODCase's important role in the de novo synthesis of pyrimidine nucleotides, its inhibition will have a potential role in the treatment of malaria. Derivatives of the pyrimidine and purine nucleotides could be potential inhibitors of ODCase.

### 6. Methodology

A thorough literature survey is carried out on various aspects of the proposed research topic, in various peer-reviewed journals, patents, books and other research resources. Derivatives of UMP, CMP-N3-oxide and XMP would be synthesized as per schemes disclosed in the proposal. The synthesized nucleotides will be completely characterized by using several spectroscopic techniques such as NMR, mass, UV, IR, and X-ray crystallography to confirm their structures. These synthesized compounds will be tested for their efficacy to inhibit ODCase. This would be followed by documentation, publications and thesis writing.

### 7. Expected Outcome

The proposed research will lead to the development of potent ODCase inhibitors and from resulting SAR studies further lead optimization will be carried out. We anticipate that the overall outcome of this research will be a potent antimalarial drug active against current resistant Plasmodial strains.

**B. Typical Research Proposal**

**SAMPLE PROPOSAL 1**

**Out Line of the Proposed Topic of Research**

Name of the candidate : \*\*\*\*\*  
ID No. : 200\*PHXF\*\*\*  
Place of Research Work &  
Organisation : Name, City  
Proposed Supervisor Details  
Name : Dr. \*\*\*\*\*  
Qualification : Ph. D.  
Designation : Only Designation  
Organisation : Name, City

**Proposed Topic of Research**

Evaluation of Accounting Concepts in Indian Industry

**Keywords: (minimum four)**

**Objective of the Proposed Research**

1. Structural and attributes based system modeling.
2. Coding, evaluation and selection of optimum system for different applications.
3. Development of reliability and quality models and performance indices of total system.
4. Modeling and analysis of process sub systems up to component level.

**Background of the Proposed Research**

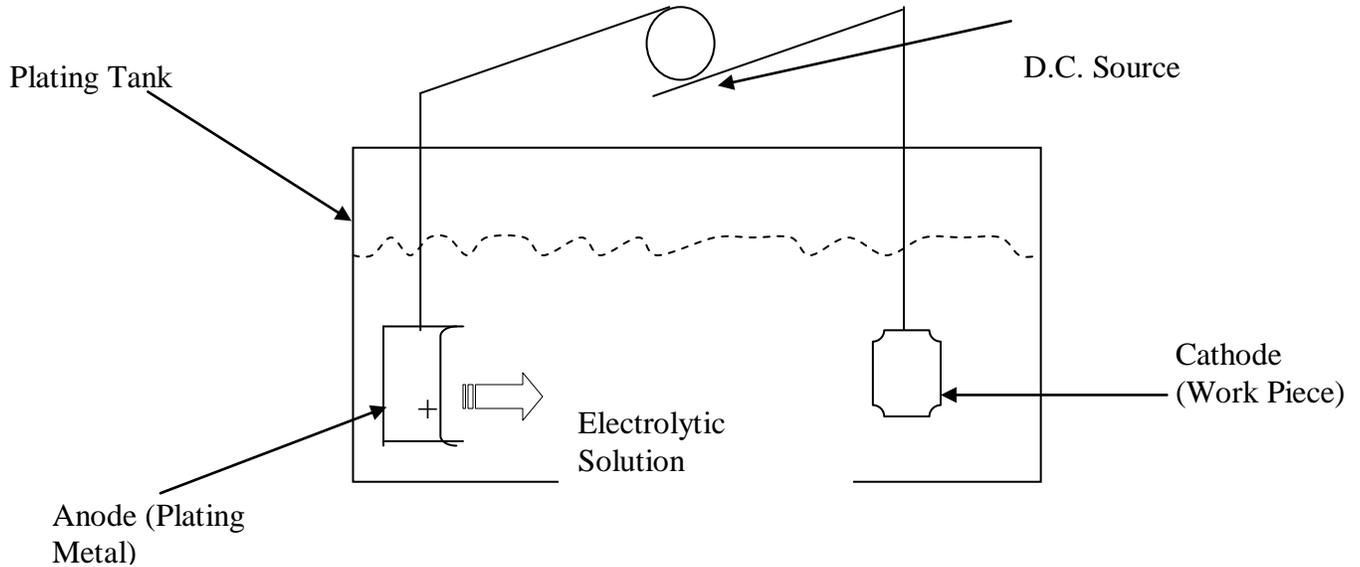
**Introduction:**

The demand of better surface quality of products by designer, manufacturer, supplier, and end user and the need for optimum surface treatment to aim at better surface quality to face the unknown situation.....

Electroplating is considered to be frequently used surface treatment process [1]. The electroplating set up is also available for experimentation and analysis as shown in figure1.

### Literature Review of Research Topic

Quality, price, aesthetic, flexibility, reliability etc. as explained by Dowey and Matthews [2], Chan and Wu [3] and Flott [4, 5] for industrial organizations, including manufacturers and users of surface coatings are increasingly seeking to ensure conformance to target specifications and low variance; using measured variables in a product or process that can be used to assess. In our work it is proposed to discuss how a non-normal physical phenomenon can be accepted as a quality system.



*Figure 1: Electroplating setup up*

Chan [6] has applied the case based reasoning- a well known Artificial Intelligence (AI) technique for electroplating industries, which has already proven its effectiveness in numerous industries. This technique ensure sufficient profit margin for electroplating manufacturer by grasping the coating weight of electroplating component accurately so that salespersons can make sure their quotation prices cover the precious metal cost [7]. Apart from quotation accuracy and responsiveness are also a critical competitive edge in electroplating industry. AI is also used by Chan and Huang [8] for management of the pollution. In this study the researcher has not identified the other factor like human aspect, aesthetic etc. which also affect their objective function. Related to this, a Fuzzy Logic (FL) concept is also applied by Lin and Lin[9], which ensure to convert knowledge from experienced staff; simulate the 'mind-set' of decision maker in solving problem through acquisition of specific knowledge and experience; and build up self-learning characteristics. It is also evident that in the selected area of surface treatment process and product there is a need for enhancement in the method of data availability, reliability,

methodology validation and system complexity. There is a scope of research work for the selection of critical and sensitive parameter and finding the interdependence of these for optimizing the combination of it. This innovative concept differentiates it from previous research work. It will be verified by conducting appropriate experiments on the electroplating set up with us. Further, it can also be suggested that it is very difficult and not practical to develop a pure robust system which is unaffected by the environmental factor like human error, atmospheric condition etc. Applying some subjective guiding rules significant improvement in the performance of system in the early learning stage can be found out. Wong et al. [10] emphasized on decision support system- a management information system for meeting the specific requirement of industries for planning and job assignment, but scheduling is missing in his work.

The optimization technique developed by G. Taguchi called as Taguchi method is also applied by number of authors as Flott [11], Mascio and Barton [12], Gaitonde et al. [13], Nian et al. [14], Singh and kumar [15], ..... nominal values, which may prove useful in conveying control quality in a common language understood by designer, engineers, operators and management. However, the limitation and disadvantage of Taguchi method is presented by Parks [16]. It states that HPD (Holistic Probabilistic Design), which holistically treats Stochastic Optimization and

### **Gap in existing Research**

It is clear from the above literature review that no body has considered ....., although some of the authors have considered only some sub systems separately like work piece material, coating material etc.[32, 33], but not all the factors and their interactions together.....

### **Methodology**

The various phases of the research activity are as described below:

**Phase I:** There would be an extensive literature survey.....

**Phase II:** Mathematical model .....

**Phase III:** Reliability, modeling and validity analysis .....

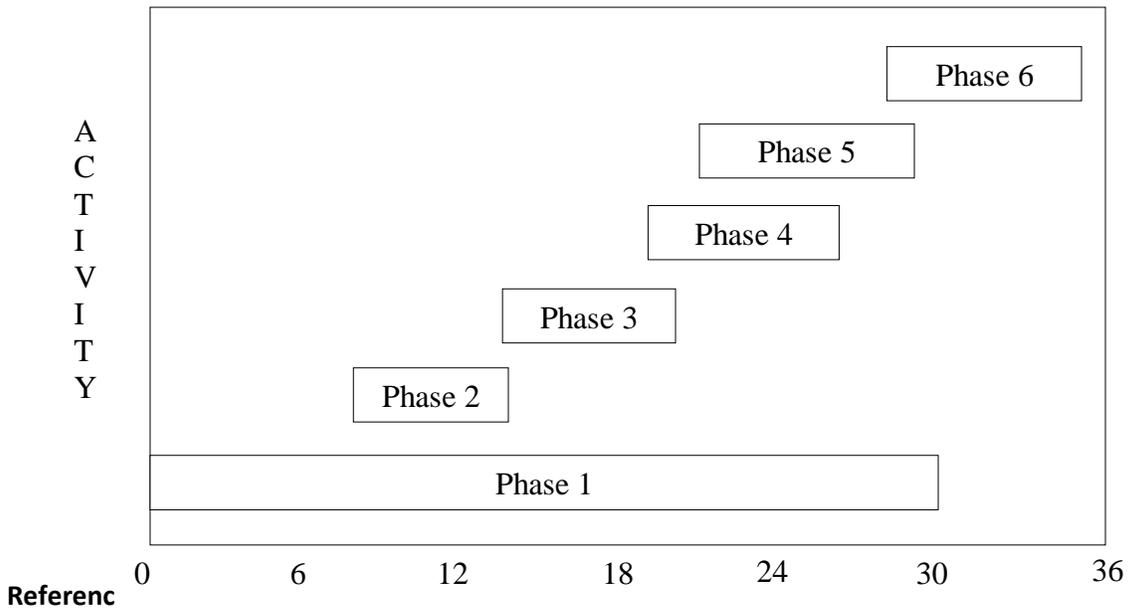
**Phase IV:** Development of methodology .....

**Phase V:** Sensitivity analysis.....

**Phase VI:** Conclusions and/or recommendations.....

**Work Plan:**

The activities scheduled and the time by which these are to be achieved are indicated in fig. 2



**Brief Biodata of the Supervisor:** DURATION IN MONTHS

*Figure 2*

**SAMPLE PROPOSAL 2**

**Outline of the Proposed Topic of Research**

Name of Candidate : \*\*\*\*\*  
ID No. : \*\*\*\*\*  
Place of Research Work and Organisation : Institute of \*\*\*\*\*, New Delhi  
Proposed Supervisor's Details  
Name : \*\*\*\*\*  
Qualification : M.Sc., Ph.D  
Designation : \*\*\*\*\*  
Organization : Institute of \*\*\*\*\*, New Delhi

**Proposed Topic of Research**

Role of Antigen Presenting Cells (APCs) and Toll like Receptors in Providing a Protective Immune Response during *Chlamydia trachomatis* Infection

**Keywords: (minimum four)**

**Objective of the Proposed Research**

1. *In vitro* study of processing and presentation of chlamydial antigens by Dendritic cells (DC's) and monocytes/macrophages to CD8<sup>+</sup> and CD4<sup>+</sup> T lymphocytes.
2. Differential regulation of cytokine production by CD8<sup>+</sup> and CD4<sup>+</sup> T lymphocytes.
3. Role of Toll like receptors 2 and 4 in recognition of Chlamydial antigens and regulation of cytokine production.
4. Regulation of nitric oxide production by chlamydial antigens.

**Background of the Proposed Research**

**Introduction**

Worldwide, an estimated 90 million sexually transmitted *Chlamydia trachomatis* infections occur each year. Sexually transmitted *C. trachomatis* infection is an important public health concern because of its adverse effects on reproduction [1]. In India alone a high chlamydial prevalence rate (28%) was found in symptomatic patients [2]. In women, infection with *C. trachomatis* causes pelvic inflammatory disease (PID) and has long term consequences – such as infertility, ectopic pregnancy and chronic pelvic pain- that are secondary to scarring of the fallopian tubes (caused by salpingitis) and ovaries. In addition, infection with *C. trachomatis* facilitates the transmission of HIV [3] and might be a co factor in human papilloma virus (HPV)-induced cervical neoplasia [4-5]. The pathological mechanism by which *C. trachomatis* induces scarring is not well understood. In all cases the pathology seems to be related to a chronic inflammation caused by a persistent chlamydial infection or by repeated infections with the bacterium.

**Literature Review: .....**

**Gap in Existing research.....**

**Methodology**

For carrying out the proposed research work facilities such as tissue culture room equipped with bio safety hood and incubator, thermocyclers for Polymerase Chain reaction, cell sorter, flow

cytometer, confocal microscope and computers for analysis and storage of data are required which are available at the Institute of Pathology.

**Phase 1:**

This phase will comprise of Literature survey.

**Phase 2:**

**(A) Enrollment of patients: .....**

**(B) Flow Cytometry:.....**

**Phase 3: Culture of Monocly derived Dendritic Cells (MDDC)**

**Phase 4: Coculture of Dendritic cells with CD8 and CD4 T lymphocytes**

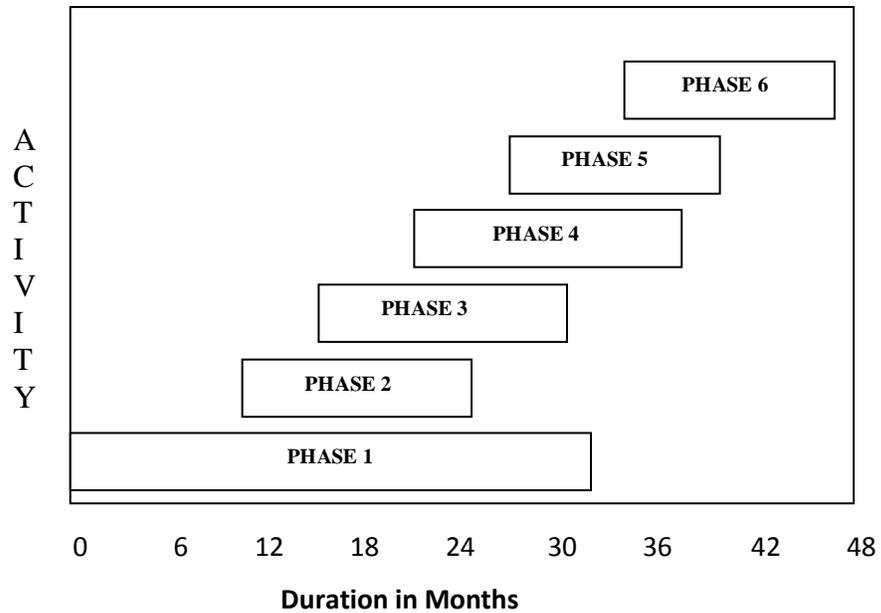
**Phase 5: (A) Blocking of Toll like receptors on dendritic cells and monocytes**

**(B) Regulation of nitric oxide production by chlamydial antigens**

**Phase 6: Conclusion and Thesis writing**

Results will be concluded with the help of the data, which we obtained throughout our research work and will be compiled in thesis.

**Work Plan :**



**References:**

1. ....
2. ....

## **Ph.D. Research Proposal Checklist**

Following should be submitted:

Appendix-1

Appendix-2: Doctoral Research Proposal [initially two hard copies (of summary and proposal document) and for final submission one hard copy (of summary and proposal document) and one softcopy in a CD (summary and proposal document as separate doc files)]

Appendix-3 (Biodata of supervisor)

Appendix-4 (Consent of supervisor's organization)

Appendix-5 (Consent of Candidate's organization)

### **General formatting guidelines**

- Page numbers at proper place and in proper format. Each page of proposal has to be given page number at bottom and at center as in Arabic (1,2,3 ....etc.) numerical.
- Proposal is stapled and NOT BOUND
- Paragraph of proposal text is justified
- Short-forms (abbreviations) are explained when they appear first time.
- Proposal text follows guidelines as given below:
  - a. Page Orientation: Portrait
  - b. Page Size: Letter or A4 size
  - c. Margins: 1 inch from all sides
  - d. Headings: Times New Roman, Bold, Size-14 points, Title case
  - e. Sub-Headings: Times New Roman, 12 points, Bold
  - f. Body-text (paragraphs): Times New Roman, 12 points, Not bold Justified

### **Proposed Topic of Research**

- Title of the proposed research topic is same in Appendix-1 and Appendix-2
- Title of the proposed topic not too lengthy
- Title reflects overall objective

### **Objectives of Proposed Research**

- Objectives are based on literature survey
- Objectives are clearly spelt out
- Objectives are point-wise and crisp
- Objectives are placed just after proposed topic of research and just before background of research

### **Background of Proposed Research**

- The proposed topic (objective) is based on in-depth literature survey.
- Proposed topic is derived based on journal articles/research papers
- Literature survey include latest references
- Research gap/need of research is clearly identified
- How the research gap is proposed to filled is clearly mentioned in the research proposal

### **Methodology and Work Plan**

- Methodology is given phase-wise/step-wise
- Phase-1 will be literature survey and last phase will be conclusions and thesis writing
- Work-plan is also given in the form of activity chart (bar chart)
- Phases in methodology and activity chart are matching.
- In methodology, brief explanation about how research is conducted under each phase is described
- Phases of methodology are specific and relevant to topic

### **References**

- All the references listed in reference section are mentioned in text of proposal
- Number of references in reference section: \_\_\_\_\_
- Number of references cited in-text: \_\_\_\_\_
- In text references are in square bracket (as per format) e.g. [2]
- In-text references numbering is in sequence
- References are number wise in-text as well as at the end of the proposal in reference section.
- Outline of Proposed Topic of Research (Appendix-2) is not lengthy and not exceeding 12 pages.
- Uniformity of reference format is maintained in proposal and reference are formatted as per guidelines. Sequence of the part of reference citation is uniform for all the reference of same type.
- References contain all the necessary parts. No part is missing.