

SYLLABUS FOR Pre-Ph.D. COURSEWORK

(For all subjects under the Faculty of Engineering & Technology (Except Pharmacy))

RESEARCH METHODOLOGY & COMPUTER APPLICATIONS

1. Research:

- a) Types, Research process and steps in it, Hypothesis, Research proposals and aspects.
- b) Research Design: Need, Problem Definition, variables, research design concepts, Literature survey and review, Research design process, Errors in research.
- c) Research Modeling: Types of Models, Model building and stages, Data consideration and testing, Heuristic and Simulation modeling.
- d) Report Writing: Pre writing considerations, Thesis writing, Formats of report writing, Formats of publications in Research journals.

2. Design of Experiments:

- a) Objectives, strategies, Factorial experimental design, Designing engineering experiments, basic principles-replication, randomization, blocking, Guidelines for design of experiments.
- b) Single Factor Experiment: Hypothesis testing, Analysis of Variance components (ANOVA) for fixed effect model; Total, treatment and error of squares, Degrees of freedom, Confidence interval; ANOVA for random effects model, Estimation of variance components, Model adequacy checking.
- c) Two factor Factorial Design, Basic definitions and principles, main effect and interaction, response surface and contour plots, General arrangement for a two-factor factorial design; Models-Effects, means and regression, Hypothesis testing.

3. Computer Applications :

- a. **Spreadsheet Tool:** Introduction to spreadsheet application, features and functions, Using formulas and functions, Data storing, Features for Statistical data analysis, Generating charts/ graph and other features. **Tools used may be Microsoft Excel, Open office or similar tool.**
- b. **Presentation Tool:** Introduction to presentation tool, features and functions, Creating presentation, Customizing presentation, Showing presentation. **Tools used may be Microsoft Power Point, Open Office or similar tool.**
- c. **Web Search:** Introduction to Internet, Use of Internet and WWW, Using search engine like Google, Yahoo etc, Using advanced search techniques.

References:

1. Montgomery, Douglas C. (2007), 5/e, Design and Analysis of Experiments, (Wiley India)
2. Montgomery, Douglas C. & Runger, George C. (2007), 3/e, Applied Statistics & Probability for Engineers (Wiley India)
3. Kothari C.K. (2004), 2/e, Research Methodology- Methods and Techniques (New Age International, New Delhi)
4. Krishnaswamy, K.N., Sivakumar, Appa Iyer and Mathiranjana M. (2006), Management Research Methodology; Integration of Principles, Methods and Techniques (Pearson Education, New Delhi)
5. The complete reference Office Xp – Stephan L. Nelson, Gajula Kelly (TMH)
6. Basic Computer Science and Communication Engineering – R. Rajaram (SCITECH)
7. Book for Open Office.

EXAMINATION SCHEME FOR THE PRE-PH.D. COURSE WORK FOR THE FACULTY OF ENGG. & TECH.

1. Examination Scheme:

a) The question paper will be of 100 marks.

b) There will be five questions of twenty marks each. All the five questions shall be compulsory.

c) The pattern of the question paper shall be as follows.

Q. 1. Objective questions of multiple choice type.

20 questions to be answered out of 25 (13 of 25 the questions will be based on Research Methodology (RM) and remaining 12 based on quantitative techniques (QT) and computer applications (CA).)

Q. 2. Short answers type questions (any four out of six)

a), b) & c) based on R. M.

d), e) & f) based on QT & CA

Q. 3. Long answer type questions (any two out of four)

a) & b) based on R.M.

c) & d) based on QT & CA

Q. 4. Preparation of any suitable research proposal
(Detailed Scheme)

Q. 5. Short notes (any two out of four)

2. Evaluation Scheme:

a) The answer papers will be assessed independently by two examiners - one internal and the other external.

b) The candidate must obtain minimum an average of 40 % marks to qualify in the course work.

SHIVAJI UNIVERSITY, KOLHAPUR.
FACULTY OF ENGINEERING & TECHNOLOGY
Syllabus For PHARMACY Pre Ph.D. Coursework

RESEARCH METHODOLOGY

1. Research:

1.1 Definition of research, Applications of research and types, Research process and steps in it, Deductive and inductive reasoning; **Validity**-conclusion, internal, construct and external.

1.2 Literature review- Need, Procedure- Search for existing literature, Review the literature selected, Develop a theoretical and conceptual framework, Writing up the review, **Formulating a research problem**: Sources, Considerations, Steps in formulation of a problem, formulation of objectives, **Definition of variables** – Concepts, indicators and variables, Types of variables, Types of measurement scales, **Constructing the Hypothesis**- Null(Research) and alternative, one-tailed and two-tailed, Hypothesis testing, errors in testing.

1.3 Research Modeling: Types of Models, Model building and stages, Data consideration and testing, Heuristic and Simulation modeling, Data collection methods, Surveys-types and method selection.

2. Research Design:

2.1 Design of Experiments: Objectives, strategies, Factorial experimental design, Designing engineering experiments, basic principles- replication, randomization, blocking, Guidelines for design of experiments, **Simple Comparative Experiments**-Basic statistical concepts, random variable, sample mean and variance, degrees of freedom, standard normal distribution, statistical hypothesis, Two sample *t*-test, *P*-value, Confidence Intervals, Paired comparisons,

2.2 Single Factor Experiment: Analysis of Variance (ANOVA) for fixed effect model; Total treatment and error sums of squares, Decomposition of total sum of squares, ANOVA for Randomized complete block design to control effects of nuisance factors.

2.3 Two factor Factorial Design: Basic definitions and principles, main effect and interaction, response surface and contour plots, General arrangement for a two-factor factorial design; Models- Effects, means and regression.

2.4 Taguchi Techniques for Experimental Design: Taguchi loss function, Average loss, nominal-the-best, smaller-the-best, larger-the-best, design process steps, selection of factors affecting- methods, factor levels, Test strategies- Full factorial experiment, fractional factorial experiment, Orthogonal arrays and their selection; **Parameter Design**- Control and noise factors and parameter design, signal to noise ratio, types, parameter design strategy, tolerance design, robust design.

3. Research Proposal: Contents-Preamble, the problem, objectives, hypothesis to be tested, study design, setup, measurement procedures, analysis of data, organization of report; Displaying data-tables, graphs and charts, **Writing a research report**- Developing an outline, Key elements- Objective, Introduction, Design or Rationale of work, Experimental Methods, Procedures, Measurements, Results, Discussion, Conclusion, Referencing and various formats for reference writing of books and research papers, Report Writing- Prewriting considerations, Thesis writing, Formats of report writing, Formats of publications in Research journals

4. Drug Regulatory Affairs: Indian Patent Act 1970, its amendments, concepts of IPR, criteria for granting patents and filing a Indian patent, PCT, Patent infringement. INDA/NDA/ANDA filing. Para-I, II, III, IV filing. Hatch-Waxman amendments. Introduction to Patent Search. OECD guidelines for chemical testing pertaining to use as drug, related substances, excipients, toxicity, etc. WHO guidelines for standardization of raw material and finished products including herbal products.

5. Pharmaceutical Analysis: Principles and applications of the following: Absorption spectroscopy (UV, visible and IR). Principles of NMR, ESR, Mass spectroscopy, X-ray diffraction analysis and different chromatographic techniques and methods, Thermal Techniques.

6. Computational Analysis and Its Applications In Pharmaceutical Sciences:

Introduction to the creation and advancement of databases, algorithms, computational and statistical techniques for data analysis. Applications of computational analysis in prediction of protein structure, modelling biological systems like ion channels and biomembranes, predicting ADME of drugs and drug like substances, predicting toxicity of xenobiotics/drugs, predicting protein – biomolecule interactions, predicting protein/receptor-ligand interactions, predicting polymer-drug interactions, etc. Introduction to molecular design and modelling softwares, computational genomics, bioinformatics, health informatics, cheminformatics, metabolic network modelling, enzyme-network modelling, graphics processing unit for molecular simulations, biomedical imagery and high throughput image analysis. Applications of Microsoft excel for quantitative and statistical data analysis.

References:

- Central Drugs Standard Control Organization <http://cdsco.nic.in/>
<http://www.patentoffice.nic.in/>
http://www.ignou.ac.in/schools/sos/ipr_web2/IPR_Awareness/Web%20pages/UNIT%204.pdf
<http://en.wikipedia.org/wiki/www.pci.nic.in/contents.htm>
www.oecd.org/dataoecd/9/11/33663321.pdf
<http://www.fda.gov/fdac/special/testtubetopatient/studies.html>
<http://www.fda.gov/cder/about/smallbiz/faq>
 Available at: <http://www.fda.gov/cder/consumerinfo>
http://www.fda.gov/cder/consumerinfo/generic_info/generics_question_brochure
 Ranjit Kumar, (2006), Research Methodology- A Step-By-Step Guide for Beginners, (Pearson Education, Delhi) ISBN: 81-317-0496-3
 Trochim, William M.K., (2003), 2/e, Research Methods, (Biztantra, Dreamtech Press, New Delhi), ISBN: 81-7722-372-0
 Montgomery, Douglas C. (2007), 5/e, Design & Analysis of Experiments, (Wiley India)
 Montgomery, Douglas C., & Runger, George C. (2007), 3/e, Applied Statistics & Probability for Engineers, (Wiley, India)
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 Ross, Philip J. (1996), 2/e, Taguchi Techniques for Quality Engineering, (McGraw Hill, NY)
 Besterfield, Dale H. (2005), 3/e, Total Quality Management, (Pearson Education, New Delhi)
 Krishnaswamy, K. N., Sivakumar, Appa Iyer and Mathirajan, M. (2006), Management Research Methodology: Integration of Principles, Methods and Techniques (Pearson Education, New Delhi).

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