



**National Computing Education Accreditation Council**  
**NCEAC**



NCEAC.DOC.001-E

**COURSE DESCRIPTION**

|                                    |                                |
|------------------------------------|--------------------------------|
| <b>NAME OF INSTITUTION</b>         | Lahore Garrison University     |
| <b>PROGRAM (S) TO BE EVALUATED</b> | Computer Science , Spring 2022 |

**Course Description :**

| Course Code                                                                                                                                                                                                                                                                   | CSC713                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
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| Course Title                                                                                                                                                                                                                                                                  | Research Methodology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| Credit Hours                                                                                                                                                                                                                                                                  | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| Prerequisites by Course(s) and Topics                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)                                                                                                                                                             | SESSIONAL (Quizzes, Assignments, Presentations) =25 %<br>Midterm Exam =25 %<br>Final Exam = 50%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| Course Coordinator                                                                                                                                                                                                                                                            | Dr. Muhammad Asif                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| URL (if any)                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| Current Catalog Description                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| Textbook (or Laboratory Manual for Laboratory Courses)                                                                                                                                                                                                                        | Research design: Qualitative, quantitative and mixed methods approaches, Creswell, J. W. Thousand Oaks, CA: Sage, 4th Ed. 2014.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| Reference Material                                                                                                                                                                                                                                                            | 1. A Gentle Guide to Research Methods: Gordon Rugg and Marian Petre. 2. Handouts, Tutorial, Research Papers and Slides                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| Course Goals                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| Course Learning Outcomes (CLOs):                                                                                                                                                                                                                                              | <table><tr><th>At the end of the course the students will be able to:</th><th>Domain</th><th>BT Level*</th></tr><tr><td>1. To understand why do researcher do research?</td><td></td><td></td></tr><tr><td>2. To understand basic concepts of research, its methodology and terminology.</td><td></td><td></td></tr><tr><td>3. To apply the knowledge of research processes (reading, evaluating, and developing).</td><td></td><td></td></tr><tr><td>4. To understand ethical principles of research, ethical challenges and approval processes.</td><td></td><td></td></tr><tr><td>5. To apply quantitative, qualitative and mixed approaches to address the research problem. Identify the components of a literature review process. To critically analyze and evaluate the published research.</td><td></td><td></td></tr><tr><td>To write an appropriate research problem and define parameters. To distinguish among problem statement, a research question or hypothesis, and a research objective. To organize and conduct research in more appropriate manner. To write research paper, report and thesis.</td><td></td><td></td></tr><tr><td>* BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain</td><td></td><td></td></tr></table> |           |  | At the end of the course the students will be able to: | Domain | BT Level* | 1. To understand why do researcher do research? |  |  | 2. To understand basic concepts of research, its methodology and terminology. |  |  | 3. To apply the knowledge of research processes (reading, evaluating, and developing). |  |  | 4. To understand ethical principles of research, ethical challenges and approval processes. |  |  | 5. To apply quantitative, qualitative and mixed approaches to address the research problem. Identify the components of a literature review process. To critically analyze and evaluate the published research. |  |  | To write an appropriate research problem and define parameters. To distinguish among problem statement, a research question or hypothesis, and a research objective. To organize and conduct research in more appropriate manner. To write research paper, report and thesis. |  |  | * BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain |  |  |
| At the end of the course the students will be able to:                                                                                                                                                                                                                        | Domain                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | BT Level* |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| 1. To understand why do researcher do research?                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| 2. To understand basic concepts of research, its methodology and terminology.                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| 3. To apply the knowledge of research processes (reading, evaluating, and developing).                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
| 4. To understand ethical principles of research, ethical challenges and approval processes.                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
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| To write an appropriate research problem and define parameters. To distinguish among problem statement, a research question or hypothesis, and a research objective. To organize and conduct research in more appropriate manner. To write research paper, report and thesis. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |  |                                                        |        |           |                                                 |  |  |                                                                               |  |  |                                                                                        |  |  |                                                                                             |  |  |                                                                                                                                                                                                                |  |  |                                                                                                                                                                                                                                                                               |  |  |                                                                                       |  |  |
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**Topics Covered in the Course, with Number of Lectures on Each Topic** (assume 15-week instruction and one-hour lectures)

| Week           | Lecture        | Topics Covered                                                                                                                                                                                                                                      |
|----------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1         | 1              | Introduction to the research, What is research? Why do we do research? Who does research? The basic steps of research.                                                                                                                              |
|                | 2              | Research basics, Research characteristics, research projects and its pitfalls. sources of research problem                                                                                                                                          |
| Week 2         | 3              | Hypothesis, delimitations, definitions, assumptions, research proposal and its components                                                                                                                                                           |
|                | 4              | Research process, methodologies and comparison among different research methodologies.                                                                                                                                                              |
| Week 3         | 5              | Literature Review, Why literature review? How to conduct literature review? Topic identification, Sources of literature.                                                                                                                            |
|                | 6              | Reading the literature, Research paper template                                                                                                                                                                                                     |
| Week 4         | 7              | How to read a research paper? Comprehension and Evaluation                                                                                                                                                                                          |
|                | 8              | Synthesis and Paper review                                                                                                                                                                                                                          |
| Week 5         | 9              | How to write a paper? Types of research papers. A scientific contribution, Structure of a paper.                                                                                                                                                    |
|                | 10             | Literature review analysis and synthesis, systematic and argument analysis.                                                                                                                                                                         |
| Week 6         | 11             | Methods of argument analysis, Fisher and Toulmin method. Assembling and organizing literature using map.                                                                                                                                            |
|                | 12             | Writing the literature review and Review article                                                                                                                                                                                                    |
| Week 7         | 13             | Research article, table, figure and equation citations and indexing.                                                                                                                                                                                |
|                | 14             | Preparing Bibliography, APA style, MLA, Chicago manual. Where to publish? A template for reviewing                                                                                                                                                  |
| <b>Week 8</b>  | <b>1 hours</b> | <b>Mid Term</b>                                                                                                                                                                                                                                     |
| Week 9         | 15             | Elementary statistics, Population, sample, parameter, statistics, quantitative and qualitative data, level of measurements, designing experiments.                                                                                                  |
|                | 16             | Methods of sampling, frequency distributions, analysis of frequency distributions, basic measures (ratio, proportions and fractions, percentage, percents, percent change, percent increase, percentile, rate, exponential notations and precision) |
| Week 10        | 17             | Data analysis, descriptive statistics, Mean, Median, Mode and Range, Standard deviation and variance                                                                                                                                                |
|                | 18             | Skewness, Kurtosis, coefficient of variance, correlation, regression, histogram and data normalization, Discussion related to Midterm Exam.                                                                                                         |
| Week 11        | 19             | Confusion/Error matrix, Important terms, Rates calculations, Accuracy                                                                                                                                                                               |
|                | 20             | Misclassification rate, Recall, False positive rate, True negative rate, precision, F-measure                                                                                                                                                       |
| Week 12        | 21             | Receiver Operator Characteristics (ROC), creating ROC, interpreting the ROC                                                                                                                                                                         |
|                | 22             | Area under the curve, Relation between sensitivity, specificity, FPR and Threshold                                                                                                                                                                  |
| Week 13        | 23             | Measure of Association, strength of prediction, classification problems, classification accuracy, confidence interval for classification accuracy,                                                                                                  |
|                | 24             | Impact of sample size, reliability and validity, Std Deviation and coefficient of variation                                                                                                                                                         |
| Week 14        | 25             | Z Score, Standard (Z) scores, calculating Z Scores, Interpreting Z Scores                                                                                                                                                                           |
|                | 26             | Z Score tables, Use of Z score tables, Cumulative Z score, Level of confidence,                                                                                                                                                                     |
| Week 15        | 27             | Research problem identification, Research proposal writing, Why do we need to write proposal?                                                                                                                                                       |
|                | 28             | Contents of research proposal, Presentations,                                                                                                                                                                                                       |
| Week 16        | 29             | Writing research reports and thesis. Contents of report and thesis.                                                                                                                                                                                 |
|                | 30             | Presentations, Discussion about final exam                                                                                                                                                                                                          |
| <b>Week 17</b> | <b>2 hours</b> | <b>Final Term</b>                                                                                                                                                                                                                                   |

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|----------------------------------------------------|-------|
| Laboratory Projects/Experiments Done in the Course | Latex |
| Programming Assignments Done in the Course         | Yes   |

|                        |                   |
|------------------------|-------------------|
| <b>Instructor Name</b> | Dr. Muhammad Asif |
|------------------------|-------------------|

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| <b>Instructor Signature</b> |
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|             |
|-------------|
| <b>Date</b> |
|-------------|